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TRANSPORTATION DEMONSTRATION PROJECT

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PROGRESS REPORT #2
MARCH 1969

MASS TRANSPORTATION DEMONSTRATION PROJECT

**Project No. MO-MTD-1
Contract No. H-932**

March, 1969

PROGRESS REPORT NO. 2

**Human Development Corporation of
Metropolitan St. Louis**

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PREFACE

Many events have transpired since the publication of the first progress report. One demonstration line has been put into operation; it has since undergone two major route revisions and one major scheduling change. The originally contemplated work program has been reoriented in the light of unforeseen constraints on the availability of data and revised planning criteria. A sample population of the ridership has been intensively investigated with the aid of a pilot survey prepared for this purpose by the MTDP staff, and additional information pertaining to the line's users has been obtained by other subcontractors. A system has been devised for the purpose of aggregating and utilizing relevant population and employment data; it is called the Mass Transportation Master File (MTMF). Finally, a second transportation corridor has been recommended by the MTDP staff. These topics, along with relevant personnel and financial data, are the primary ones covered in the following report.

Although this report naturally represents the work of the entire MTDP staff - and others - it is appropriate to note here the particular contribution of four persons

who have been with the project since its inception some eighteen months ago: Professor Coenraad Mohr, our consultant, who has been instrumental in assisting with the draft of this and other reports; Mrs. Marjorie Ramsey, who was responsible for the physical preparation of this document; Myron Pollack, who directed the data collection and analysis; and Jerry Margulis, who transformed the Mass Transportation Master File from an idea into a functional system.

Joseph S. Hupert
Coordinator, MTDP

INTRODUCTION

This is the second progress report by the Mass Transportation Demonstration Project (MTDP) staff of the Human Development Corporation of Metropolitan St. Louis (HDC) on Project No. MO-MTD-1. The contract for this project was secured for the City of St. Louis by the St. Louis Model City Agency through the U. S. Department of Housing and Urban Development (HUD) on September 11, 1967. On the same date, the City of St. Louis subcontracted with HDC to conduct the planning, research and evaluation for the project. On January 23, 1968, the City entered into a contract with the Bi-State Development Agency to provide and manage the physical bus-transportation services of the project. Finally, on February 23, 1968, the City signed an agreement with Voss and Associates to implement the advertising and public involvement segment of the project. The MTDP is currently funded by the U. S. Department of Transportation under a federal grant of \$1,147,500 with local supplements of \$122,500.

TABLE OF CONTENTS

	Page
1. General Purpose of the MTDP	1
2. Review	3
3. The TEMPO/Northwest Line	6
4. Selection Procedure for Additional Bus Routes	18
5. Description of Basic Planning Data	33
6. Evaluation Phase	35
6.1 Ridership and Financial Performance	36
6.2 Analysis of Passenger Characteristics	37
7. Revision in MTDP Activity Network	43
8. Job Development and Placement Efforts	47
Technical Appendix I - Review of Ridership and Financial Performance	53
Technical Appendix II - Passenger Profile, Summer 1968	70
Technical Appendix III - The Fenton Route Recommendation	84
Technical Appendix IV - Reduction in Service Memorandum	106
Technical Appendix V - On-bus Questionnaire and Employer Fact Sheet	112
Technical Appendix VI - Mass Transportation Master File	121
Appendix I - Staff and Organizational Structure	130

1. General Purposes of the MTDP

The general purposes of the St. Louis Mass Transportation Demonstration Project were stated as follows in the grant application:

- 1. To determine the need for and acceptance of direct transit service to outlying industrial complexes and other areas of employment from city residential areas.**
- 2. To determine whether mass transportation services in low income residential areas require modification and the extent thereof.**
- 3. To determine to what extent sociological changes, in terms of lessening isolation of inner-city residents, occur as a result of transportation changes.**
- 4. To test specialized promotional techniques, in low income areas.**

The City of St. Louis has delegated to the St. Louis Model City Agency the responsibility to coordinate activities under the MTDP toward the achievement of these general objectives. The Model City Agency holds regular joint meetings of officials from the Human Development

Corporation, the Bi-State Development Agency, and Voss and Associates to implement synchronization of their several programs of activity for the common objectives of the project. The current report refers specifically to the activities of the staff group at the Human Development Corporation who are assigned to the MTDP. References to the contributions and activities of the Bi-State Development Agency and Voss and Associates are limited to those instances where joint responsibility or cooperative effort are involved.

The MTDP staff of the Human Development Corporation are primarily responsible for planning and recommending bus routes and schedules to the Model City Agency for implementation and for follow-up evaluation of the various socio-economic effects of the service. The work of the MTDP group has, therefore, generally consisted of research and planning activities; most of the staff's time has been devoted to the collection of data, their analysis and interpretation, and the presentation of the results with recommendations for implementation.

The primary thrust of the planning activities of the MTDP has been to create demonstration bus lines well-suited for testing the major hypothesis underlying the

project. This hypothesis is that workers from the inner-city poverty areas of St. Louis can, with the aid of well-designed bus lines, be effectively placed in suburban employment, thus providing them a better life and suburban employees a richer supply of labor.

2. Review

This section contains a brief review of the previous progress report made by the MTDP staff. The comments from the previous report serve as a backdrop for a discussion of the topics to be covered in the remainder of this report. They should provide the reader the necessary perspective to interpret the sequence of events described in the two reports.

The first report of the HDC/MTDP staff started with a description of project objectives and the roles of various local agencies in contributing to the potential success of the project. The generalizations made then are still valid now. Experience has simply lent emphasis to the importance of interagency cooperation in successful data collection and project planning and implementation. Some critical incidents reflecting both success and failure in this respect are referred to in later sections of this report.

The previous progress report also detailed the plan of action that the staff of the MTDP has developed for the conduct of their portion of the transportation experiment. The role of the MTDP staff during the planning phase of the project was summarized in a PERT activity network. A revision and elaboration of this network of planned activities forms part of the current report.

The first progress report contained details on research completed by the MTDP staff. This research concerned the hypothesis that disadvantaged residents of different areas of the City of St. Louis differ significantly in their occupational skills. The hypothesis was not borne out; to the contrary, it was concluded that skill differences across disadvantaged neighborhoods were insignificant. There appears to be a fairly uniform need, in proportion to population, for all categories of employment opportunities over the neighborhoods considered in the analysis. In the present instance, the mixture of skills as a factor in the geographic matching of labor supplies with labor demands is thus not of practical importance.

The original program of the MTDP staff included the premise that neighborhood skill-mix would be an important factor in effective planning of routes. The

research indicated a homogeneous and general need for employment opportunities across the disadvantaged neighborhoods of St. Louis. Unfortunately, the available skills in these neighborhoods were found to be largely limited to occupations of low socio-economic status. The supply of labor for these occupations is large relative to the demand and potential wages are correspondingly unattractive. The research, therefore, lent further emphasis to the need for backing up any transportation services with vigorous job development and community involvement programs.

The MTDP staff had also completed a recommendation for the implementation of a pilot bus line to the Hazelwood industrial complex by the time the first progress report went to the printer. The report contained a detailed discussion of the foundations for the recommendation and the potential advantages and disadvantages associated with the recommended course of action. The present report contains sections describing and evaluating the results of the recommendations.

The first report further described the progress that had been made on the route planning and evaluation phases of the MTDP staff assignment. The method of

route selection has been made much more specific and plans and instruments for the evaluation phase of the study have been developed. Systems for the analyses of base population and employment data by relevant area breakdown have also been made operational since the first progress report was published.

The present report contains a description and account of the operations of the TEMPO/Northwest line; a detailed description of the planning and evaluation procedures; an analysis of the line's financial performance; an analysis of the ridership characteristics of the line's passengers; a description of the associated job development and placement efforts; a recommendation for an additional route; and various explanatory technical appendices.

3. The TEMPO/Northwest Line

On February 27, 1968 the Human Development Corporation formally recommended a bus route and bus schedule to the Hazelwood industrial complex from the City of St. Louis. Voss and Associates, the advertising and community involvement agency, suggested the term TEMPO as a name for the transportation services to be provided under the

St. Louis Mass Transportation Demonstration Project. TEMPO is an acronym for "Transportation, Employment and Manpower Provide Opportunities." Voss and Associates selected this title as a promising vehicle for publicizing the primary purpose of the project.

The recommended bus route was approved and arrangements were made for implementation of the TEMPO/ Northwest line by Monday, April 29, 1968. The MTDP staff and Bi-State officials worked as a team to draw up final scheduling of service between the City of St. Louis and the Hazelwood area. Meetings were necessary to: 1) resolve the details of the proposed fare structure; and 2) to negotiate an equitable basis for distribution of the revenues from the route between the project and Bi-State. The MTDP staff, in cooperation with HDC's Division of Work Programs, held meetings with employers in the Hazelwood area and with other job development agencies. In addition, a meeting of many of the major employers in the area was convened by HDC's Chief of Work Programs in order to familiarize them with the service. (See Exhibit 1.) These meetings were held to encourage use of the route as a means to generate employment for inner-city residents in the Hazelwood industrial complex. Voss and Associates arranged the ceremony

County Firms Urged to Co-operate With Bus Line From the Ghetto

Representatives of 21 north-west St. Louis county industries were told yesterday that their co-operation was essential for the success of a federally subsidized bus line to transport workers from the inner city.

"The bus will run empty unless there are jobs. Jobs are the sole reason for its being," said Joseph S. Hupert, co-ordinator of the Mass Transportation Demonstration Project.

Hupert and other antipoverty program officials explained the demonstration project to businessmen at a meeting at the Ford Motor Co. assembly plant, 6250 North Lindbergh boulevard, Hazelwood.

The line is scheduled to begin operation April 29. It will connect slum neighborhoods of the city with the Hazelwood industrial complex, including the Ford plant and the McDonnell Douglas Corp.

Firms Want Bus Line

Several businessmen said after the meeting that lack of adequate transportation facilities had been an obstacle in their inner-city hiring programs and that they welcomed the addition of the bus line.

A Donald Bourgeois, director of the St. Louis Model City Agency, told the businessmen that he had been involved in many programs that match people with jobs and that "this one has the most chance for success."

"It brings new actors into the game," said Bourgeois, referring to the businessmen. "It serves two populations — industry and the hard-core unemployed."

Bourgeois said he was pleased that so few hitches had developed. He said that if the project did not work at any point, he would step in to make necessary changes. He encouraged the participation of the businessmen. "We need your ideas to make it work," he said.

Three Agencies Involved

The Model Cities Agency is co-ordinating the project with the Human Development Corporation. The bus line is operated by the Bi-State Transit System.

A \$1,200,000 federal grant from the Department of Housing and Urban Development will subsidize the line for 18 months. Officials expressed the hope that a self-sustained Bi-State line would take over at the end of that time.

The fee for the special line is 50 cents one way, 55 cents with a transfer or \$4.50 for a weekly pass. Antipoverty workers said petty cash funds from poverty programs would be provided for unemployed persons to pay for bus tickets until they obtain jobs.

Curtis Gatlin, director of manpower programs for the Human Development Corp., termed yesterday's meeting "an historic occasion."

"For many years we have

been troubled that many jobs go begging because inner city workers have no means of getting to them," Gatlin said. He said it was frustration with the lack of success of car pools and other temporary measures that led to the request for federal funds for the subsidized line.

Prejob Preparation

Gatlin said that the poverty program would provide the pre-job preparation needed for new workers, but called on the businessmen "for extra measures that will benefit you in the long run." He suggested a buddy system of overseeing new employees who have no previous consistent work record.

Ford plant officials expressed concern that the line would not deliver workers in time to start the 6:30 a.m. shift at the plant, but Hupert said the route was designed to stop at the plant at 6:15 a.m. He said it would pull into the Ford parking lot so that workers could be on the assembly line by the starting time.

Gus V. Mackensen, personnel manager of the R. C. Can Co., which is five miles west of North Lindbergh boulevard and will not be served by the line, said his firm was seeking inner city employees. He asked whether the company could be included in the route.

Bourgeois said that if a substantial number of persons, about 30 or more, would be going to work at the plant from

the inner city then a shuttle bus service from North Lindbergh boulevard could be provided to the plant.

Bourgeois said that about \$120,000 has been set aside for such special needs.

Publicity Plan

Ken Brantly, project manager for a promotional program to publicize the bus line, said it would be called TEMPO (Transportation Employment Manpower Provides Opportunities). He said Voss and Associates public relations firm, which is operating the promotional program, has hired and trained about 30 contact workers from the inner city to recruit potential workers.

Anti-poverty officials said there were 45,000 persons employed by firms at the route destination in Hazelwood with an annual rate of new hiring of at least 20,000. Bourgeois said that if 500 persons obtained jobs as a result of the bus line, then its success would be significant. He said, however, that he expected the total to be much higher.

for the official inauguration of the TEMPO bus services by the Mayor of the City of St. Louis on Friday, April 26, 1968.

The one-way fare for a cash rider on the TEMPO/Northwest line was set at \$.50; for transfer riders, this was \$.55. Riders are also entitled to use the weekly passes issued by Bi-State. A revenue sharing agreement, described in Technical Appendix I, was negotiated between the City and Bi-State.

The original TEMPO/Northwest bus service included a total of fourteen outbound and thirteen inbound buses on weekdays and one outbound and two inbound buses on Saturdays and Sundays respectively. The buses were geared to provide transportation for workers in the usual morning, afternoon, and night shifts of the Hazelwood industrial area. Two mid-day buses were scheduled on weekdays to allow job seekers access to employment interviews in the area.

The St. Louis metropolitan area is a widely dispersed area consisting of an inner-core, industrial city ringed by largely residential suburbs beyond which additional industrial areas are located. The task confronting this project is to provide economically viable bus routes

that can successfully link inner-city job seekers with outlying employment opportunities. This requires bus routes that traverse residential suburbs to reach outlying industrial concentrations. Problems of travel time and distance are acute in planning routes under these circumstances. These problems are exacerbated by the fact that all bus services supplied to the project are priced on a fixed fee per mile basis. Shorter routes are, therefore, proportionately less costly to the project than longer routes.

The original TEMPO/Northwest route was planned with the above considerations in mind. The MTDP staff, with the cooperation of Bi-State officials, attempted to design a demonstration line with an optimal interface with existing Bi-State bus lines serving poverty neighborhoods. The objective was to keep the line short but accessible by transfer, if necessary, to most of the target population. The resulting route originated close to the DeBaliviere car barn of the Bi-State Transit System and the TEMPO buses were scheduled to provide good transfer service from seventeen established Bi-State bus lines. The original TEMPO/Northwest line is shown in Exhibit 2. The MTDP staff planned this service in order that the Hazelwood demonstration would, with good

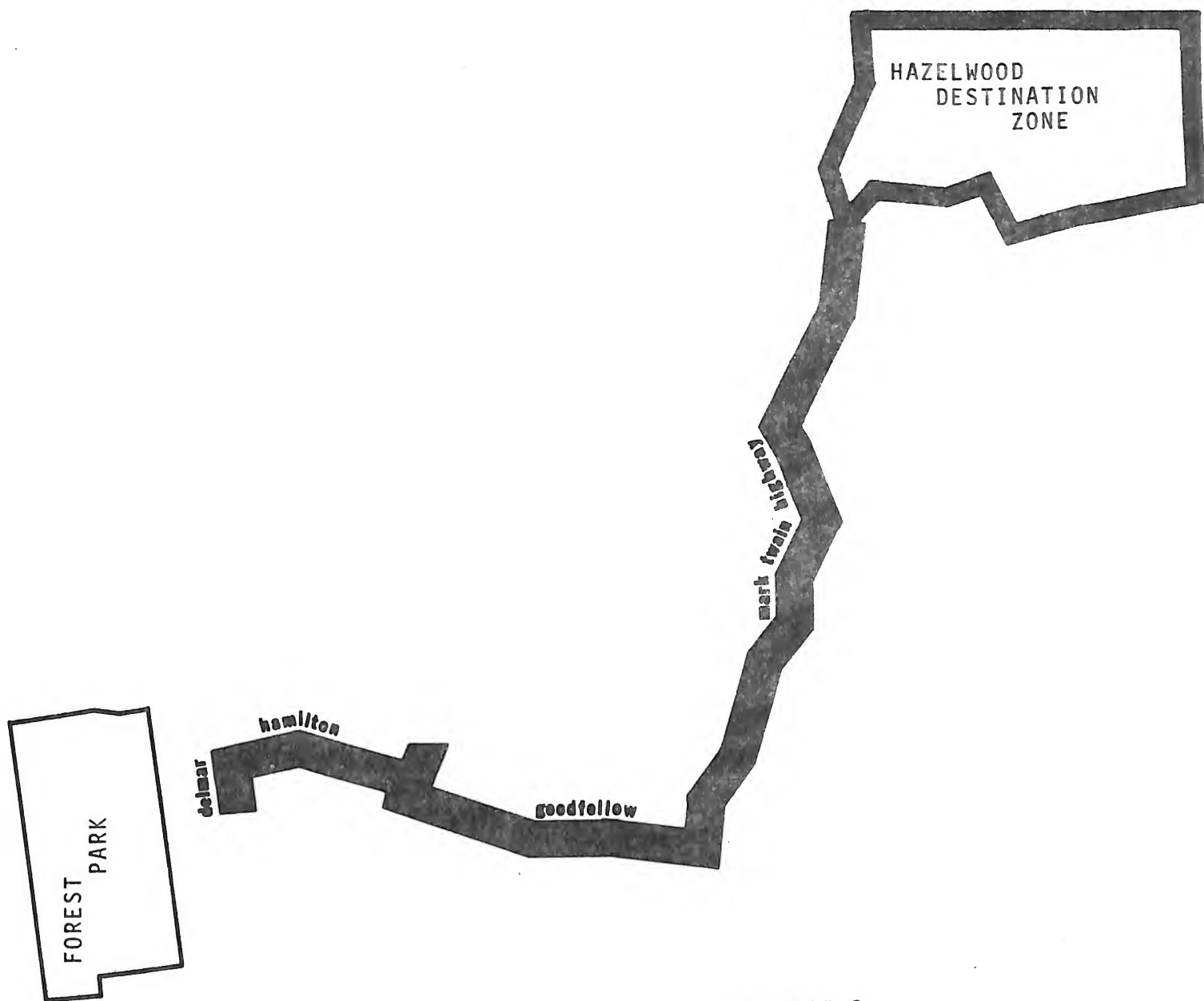


EXHIBIT 2

TEMPO Northwest

Inaugurated 4/29/68



patronage, have a chance of breaking even financially.

On the weekend of May 4, five days after service was initiated on the Hazelwood line, the articles in Exhibit 3 appeared in the local press. They were particularly surprising because possible implications concerning the location of the route had been discussed in detail with officials at the Model City Agency before a formal recommendation was submitted and approved.

The newspaper reports indicated a breakdown in communications between the City and the planning staff for the project. But, more significantly, this incident served as an object lesson in the need for insuring that technical planning be made consonant with political realities.

The TEMPO/Northwest route was changed on May 20, 1968 as announced in the newspaper articles. This resulted in a considerable increase in the total costs of running the line. The average total costs per week for the original line were \$2,593.39, while the new line (Exhibit 4) cost the project about \$3,851.46 per week to operate, or 48.5 percent more. A number of changes to improve service and/or reduce costs were made between May 20 and October 28, 1968. In addition to a number of minor adjustments in routing, scheduled times, and bus stops, three major changes in the bus service were effected.

Change Made in Route Of Poverty Bus Line

St. Louis
Post-Dispatch
May 4, 1968

A major change in the route of a federally subsidized bus line to take poverty area persons from the city to jobs in industrial plants in the suburbs was announced by A. Donald Bourgeois, director of the St. Louis Model City Agency.

The revision was made despite objections of the Human Development Corporation, which prepared the original route, the Post-Dispatch has learned.

The decision by Bourgeois to revise the route was taken "with a great deal of reluctance," Bourgeois said, because the original route had represented several months of detailed planning and analysis by staff members of the Human Development Corporation.

Bourgeois said the revision, effective May 20, will better serve areas where unemployment is most acute, including some of the major public housing projects of the city—Clinton-Peabody, Darst-Webbe and Pruitt-Igoe.

The present line, which began operating Monday, starts at the DeBaliviere loop in the West End and proceeds north and west to the Hazelwood Industrial complex. Most of the passengers from the housing projects and such slum neighborhoods as the Yeatman area

would gain access to the line by transferring from a regular Bi-State line.

"The people who need this line most didn't feel it was their bus line," Bourgeois said. "The rationale for the change is simple: The line is not serving enough people."

The new line will originate at Fourteenth street and Chouteau avenue, travel south in Fourteenth to Park avenue, west to Jefferson avenue, north in Jefferson to Natural Bridge avenue, west to Goodfellow boulevard, north in Goodfellow to Highway 70 and west to the Hazelwood industrial complex.

Bourgeois said he did not have detailed figures on the number of persons using the original line.

A number of members of the Human Development Corporation are known to be upset about the change, though they are unwilling to comment because of a reluctance to be drawn into a controversy with Bourgeois.

"Actually most of the original planning had been preserved," Bourgeois said. "All of the arrival times in Hazelwood are preserved. All we have done is move the whole thing east by a couple of miles."

The bus line was established

TURN TO PAGE 8, COLUMN 7

Change in Bus Route

FROM PAGE ONE

as part of an 18-month Mass Transportation Demonstration project funded with a \$1,200,000 grant from the United States Department of Housing and Urban Development.

Subcontracts Let

The St. Louis Model City Agency sought and obtained the grant and subcontracted with the Human Development Corporation, the area antipoverty agency, to do the research and evaluation part of the program. The Bi-State Development Agency was also subcontracted to provide the busses and operating personnel.

Miss Hartley Campbell, project director for the Department of Housing and Urban Development in Washington, said Bourgeois was empowered to make any changes that would make the line more feasible.

Two of the basic reasons for the West End line devised by

HDC were that it was shorter and less expensive to operate and that it crossed 17 established Bi-State lines, thereby providing access to persons from most areas of the city.

Savings from the shorter line were to be used for increased service or for additional lines to other suburban industrial sites. HDC staff members are known to be concerned because the new route will be considerably more costly to operate and is not accessible to residents of the West End.

Bourgeois said that West End residents would be able to transfer to the revised line from a regular Bi-State line at Goodfellow.

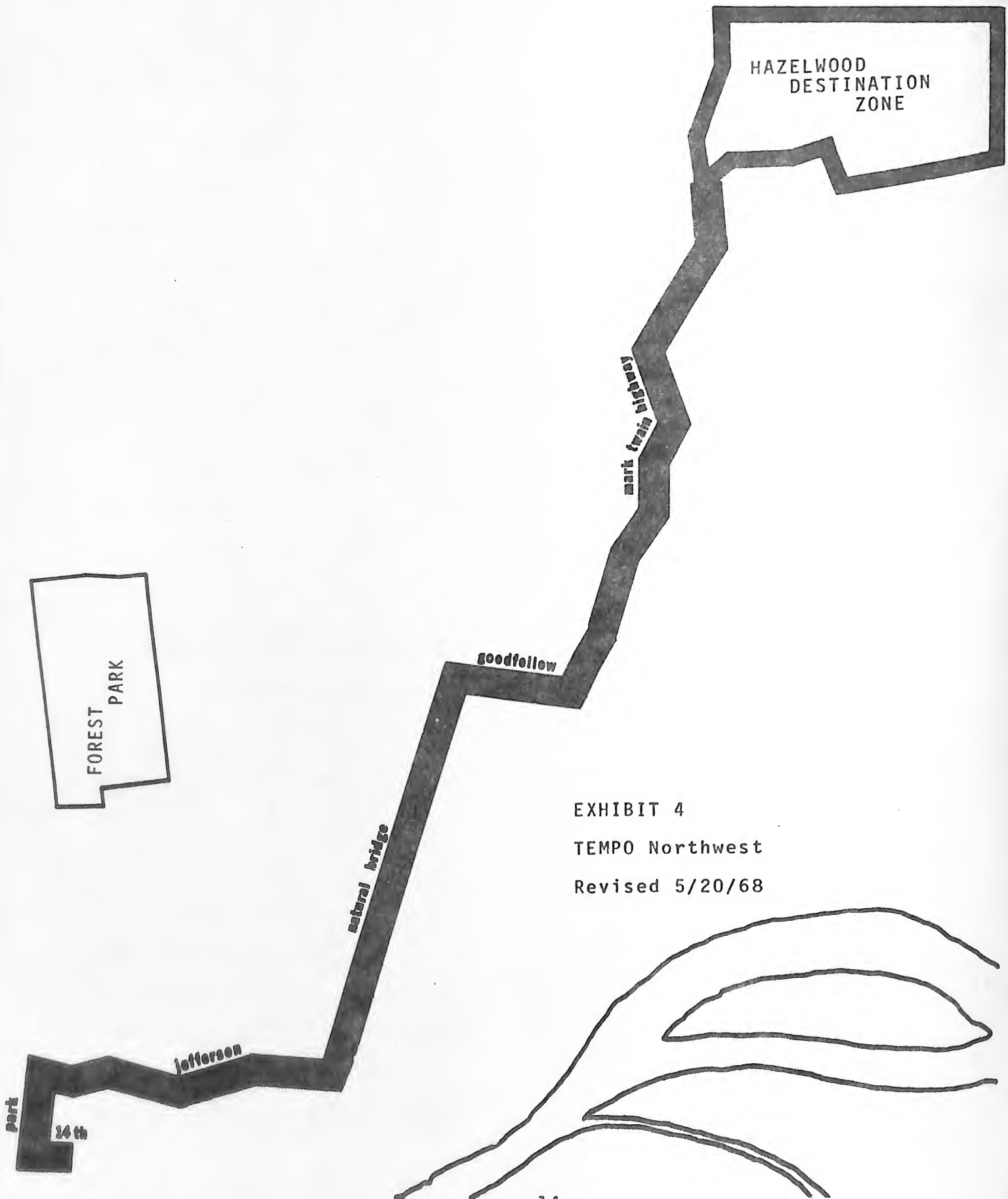


EXHIBIT 4
TEMPO Northwest
Revised 5/20/68

On May 28, 1968 Voss and Associates suggested that a change in the May 20 route might provide better, more direct service to residents of the Pruitt-Igoe, Vaughn, Carr Square, and Cochran housing projects. The Model City Agency submitted the suggestion to the MTDP staff for evaluation and the drafting of a formal recommendation, if any.

The MTDP staff, in general agreement with the substance of the proposal by Voss and Associates, submitted four alternative route changes for feasibility, cost, and time estimates to the Bi-State Development Agency. A request to field check the feasibility of including service to the all-black community of Kinloch, en route, was also submitted to Bi-State. A preferred route was selected on the basis of the Bi-State estimates.

A change-of-route recommendation, including service to residents of Kinloch, was forwarded to the Model City Agency by the Human Development Corporation. Official approval of the change was given by the Department of Housing and Urban Development. Bi-State proceeded to implement the revised service as of July 29, 1968. Exhibit 5 contains a map of the final route. Cost of service was increased from about \$3,851.46 per week to

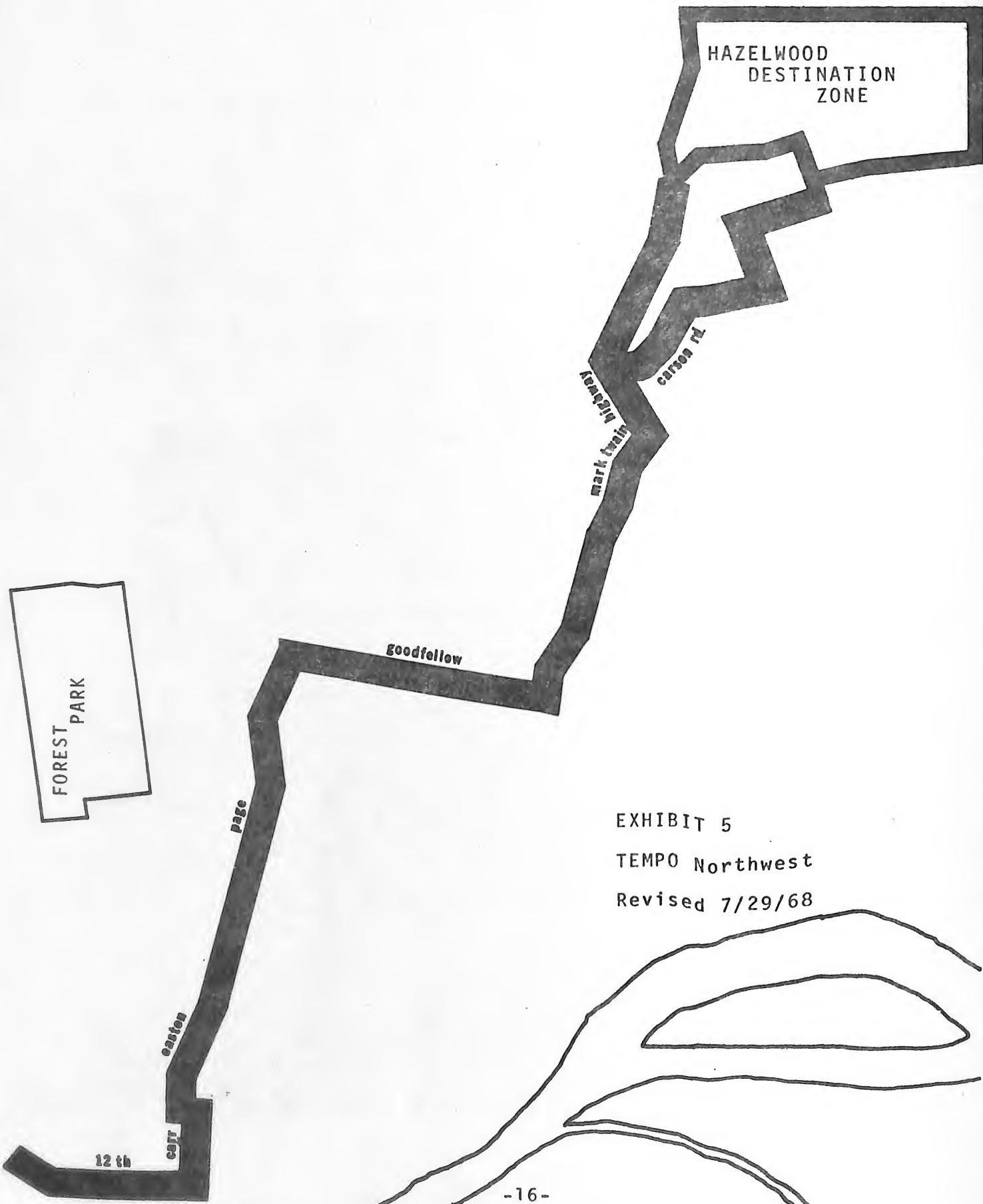


EXHIBIT 5
TEMPO Northwest
Revised 7/29/68

approximately \$4,327.55 per week, or by 12.4 percent and the average service time from the beginning to the end of the route was increased by about five minutes. All agencies involved considered these cost and time increments justified by the substantial increase in the direct service potential of the line to target area residents; however, HDC pointed out once again in its formal recommendation that this line could never be self-supporting.

During July, ridership on an early morning, outbound bus had increased to the point where about 70 passengers were being carried on a bus with seating capacity for 50 riders. A proposal to add another bus to the weekday morning, outbound schedule was, therefore, implemented effective August 5, 1968. This demand-generated increase in service added about \$213 per week to the cost of running the TEMPO/Northwest line.

Toward the middle of September, 1968 it became obvious that several of the TEMPO/Northwest buses were practically devoid of ridership. It was decided to make an analysis of bus usage as a basis for proposing discontinuation of service on those buses. The performance of the TEMPO/Northwest buses during the four-week period August 5, 1968 through September 1, 1968 was used (see

Technical Appendix IV.) On October 28, as a result of the recommendation, weekday service was reduced from 28 bus trips to 16 buses and all weekend buses on the TEMPO/Northwest line were discontinued. The cost of running the line was about \$4,566 per week at the time. The reduction in buses resulted in a decrease in weekly costs to about \$3,024.

The TEMPO/Northwest line had performed below capacity both in volume of ridership and financially. The cutback and consolidation of service of October 28 was implemented in hopes of improving the general performance of the line in the future.

4. Selection Procedure for Additional Bus Routes

The MTDP staff undertook a detailed review of the route selection procedure outlined in the proposed work program appended to the contract between the City of St. Louis and the Human Development Corporation. This work program suggested that an analysis of labor demand requirements in transportation destination zones be made and compared with an analysis of available labor supply differences in possible origin zones. Two factors led to the decision to follow a different line of

approach. First was the discovery that comprehensive, reliable data differentiating labor demand by skill level were not available. Such data as are available are not of a quality and/or quantity to be of realistic use as primary planning material in an effort of this scope. Second was the discovery, through statistical analysis of available data on labor supply in the potential origin zones, that there is no meaningful difference in skill level in these zones. This discovery was of a critical nature in that it negated one of the prime hypotheses upon which the proposed work program was based. In effect, then, it is not necessary to take occupational differences into account in defining origin zones.

The proposed work program suggested use of the "Transportation Zones" defined by the East-West Gateway Coordinating Council as the basic geographic planning unit. Close examination of these zones revealed that they suffered from two drawbacks for route selection purposes: 1) they are too large for some purposes; and 2) other data are not usually presented in commensurate units.

A series of conferences with officials of the

Transportation Staff of the East-West Gateway Coordinating Council was initiated to explore ways of overcoming these obstacles. The result of these discussions and other research as to data availability led to the decision to use the "Transportation Block" of the East-West Gateway Coordinating Council, along with "Transportation Zones", as basic planning units. The block units have the advantage of being amenable to aggregation into "Transportation Zones", while at the same time they are nearly isomorphic to U. S. Census Blocks and St. Louis City Blocks. The importance of this correspondence will become clear in reading the section describing the development of the Mass Transportation Master File.

A three-stage route selection procedure has been developed as the basic method for line selection. The procedure is based on simulation, rather than optimization techniques. Several important criteria for line selection are considered in the procedure. Since exact quantitative trade-off ratios could not be established among these criteria, a model optimizing the choice among line alternatives on a mathematical basis could not be specified.

The first stage of the line selection procedure

seeks to isolate the most promising origin and destination zones. The basic criterion for linking origin and destination zones is the potential which a bus transportation link has for generating employment of inner-city residents in suburban employments. Origin and destination zones need, therefore, to be defined in terms of their potential to supply labor and jobs respectively. If the assumptions are made that there is strong positive correlation between population density and potential labor supply and between total employment and total job vacancies, total population and total employment can be used as proxy variables for meaningful potential labor supply and demand. The definition and evaluation of alternative origin and destination zones is based on the above rationale.

The geographic unit for estimating the values of the population and employment variables had to be delineated to establish the values of the two criterion variables: origin zone population and destination zone employment. The first geographic restriction placed on the definition of the origin zones was that they had to be located within the boundaries of the City of St. Louis. Sub-zones of the City defined by the boundaries of the HDC and Model City Agency poverty areas are also considered

in evaluating the total population criterion. An additional restriction on defining the geographic limits of the origin zones related to the width of the zone around a central street defining each alternative transportation route. The origin zone is really a passenger pick-up "corridor", within the City of St. Louis. A recent study for the Bi-State Development Agency indicated that the greater majority of passengers for St. Louis bus lines came from within a quarter-mile or about three blocks on either side of the route. The population criterion variable has therefore been geographically based upon a "corridor" about one-half mile wide within the boundaries of St. Louis.

The definition of the destination zone employment criterion is similar to that of the population variable. The "employment corridor" over which employment is aggregated for each destination zone is a corridor about one-half mile wide around a central street within the suburban areas surrounding the City of St. Louis. An additional element in limiting the geographic extent of each destination corridor is the degree to which regular Bi-State buses already serve suburban St. Louis. For example, the cities of Clayton and University City are well served by Bi-State buses and are, therefore, excluded

from destination zone employment figures, even though an MTDP bus route alternative may pass through these cities.

The procedure for specifying likely population and employment corridors to link with bus services will consist of a trial-and-error matching of contiguous city blocks of high population and employment. A first approach to identifying areas of high population and employment density will be to analyze population and employment density statistics. This analysis, it is contemplated, will reveal a limited number of geographic pockets of high density target population and employment concentrations. For example, the high-rise, public housing projects in St. Louis and the McDonnell-Douglas employment complex in Hazelwood are obvious pockets of high-density, target population and employment concentrations respectively.

These pockets of population and employment concentration then serve as nuclei for the definition of provisional origin and destination zones. These zones are aggregations of city blocks representing population corridors as defined above. The resulting configuration of city blocks will provide high density population

and employment paths to be connected by alternative bus routes. A computer program has been designed to assist the MTDP staff in calculating the volume of population and employment for the different population and employment corridors. The program provides a flexible means for changing and adjusting the geographic configuration on the origin and destination zones.

The next phase of the selection procedure consists of matching origin zones with destination zones. Here the distance and travel time separating alternative origin zones from a transportation destination zone are important selection criteria. A linking of an origin zone greatly separated in time or distance from a given destination zone is less desirable than a linking of a closer origin zone. The entire set of feasible linkings of origin zones with destination zones by a bus line must, therefore, be evaluated in terms of the criterion variables of: 1) service time, and 2) distance.

Service time is an important variable in judging the likelihood of motivating passengers to use the bus service. For example, it has been maintained that few people will be willing to travel to work by bus if a ride of more than an hour in duration is involved. The

shorter the service time, the more desirable the linking of a particular pair of origin and destination zones. The distance is included as a surrogate variable for cost. Since the MTDP is charged a flat fee per mile of bus service, a near perfect correlation exists between the distance covered by a particular bus line and its potential cost to the project. The shorter the distance, the more desirable the linking of a particular pair of origin and destination zones.

The Bi-State Development Agency will make overall time and distance estimates for each alternative linking of the origin and destination zones. This will provide a basis for eliminating the obviously inferior line alternatives in terms of the four variables: 1) potential origin zone population served; 2) potential destination zone employment; 3) travel time, and 4) travel distance (cost of line). Recalculation of the values of the population and employment variables may be involved in testing different linking alternatives.

The final phase is to make a detailed evaluative comparison of the set of bus line alternatives that appear to be minimally feasible. This involves a ranking of the alternatives against one another on all relevant

criterion variables. The inclusion in this evaluation of additional criterion variables is possible. The method of line evaluation is not affected by the number of criterion variables. Addition of a criterion variable does, however, complicate the process of evaluation. The tentative line evaluation method can be described as follows:

SAMPLE TABLE

Feasible Set of Alternative Lines	Criterion #1 Population Served		Criterion #2 Labor Market Served		Criterion #3 Line Distance		Criterion #4 Line Service Time	
	No.	Rank	No.	Rank	No.	Rank	No.	Rank
A ₁	60,000	1	40,000	1	20	1	80	1
A ₂	40,000	2	30,000	3	60	3	90	2
A ₃	35,000	3	35,000	2	40	2	100	3
A ₄	30,000	4	25,000	4	65	4	120	4

The sample table above assumes four alternative lines with hypothetical criterion values and rankings. It also assumes only four criterion variables. A table such as this will be used in evaluating the relative desirability of the line alternatives. The evaluation procedure will consist of comparing each alternative line, A₁ through A_n, with every other line alternative. For example, in the table above, alternative A₁ would be compared with alternatives A₂, A₃,

and A_4 . Similarly, A_2 will be compared with A_3 and A_4 . And, A_3 will be compared with A_4 . These comparisons will be constrained so that if A_1 is preferred to A_2 and A_2 is preferred to A_3 , then A_1 must be preferred to A_3 . Also, if an alternative outranked another alternative on all of the criterion variables, it must be preferred to the other alternatives. These two restrictions will help assure consistency in the evaluation process.

For our example, A_1 must be preferred to, in general, A_2 , A_3 and A_4 , because it outranks all of them on each of the four criteria. A_2 and A_3 , however, switch in overall ranking depending upon the criterion variable involved. For example, line A_2 would serve a larger population than line A_3 , but it will serve a smaller labor market than A_3 . Alternative A_4 can, however, be eliminated immediately as inferior to all of the other alternatives since it ranks last on all the criterion variables.

Alternatives like A_2 and A_3 present a problem of trading off the advantages of one line against the advantages of the other. It therefore becomes necessary to compare these alternatives directly as pairs. Each pair of alternatives has to be ranked against one another to determine a preference ordering. In the final preference ordering each alternative must be preferred to all

alternatives of lower preference to maintain consistency in preference ranking.

A proposed procedure for making the line selection evaluations is to use a panel of judges for this purpose. The judges would be provided with a copy of the basic comparison table. Each judge would then study the comparison table and make an independent preference ordering of all the bus line alternatives. The ordering must be made within the restrictions on judgement stipulated above. The judges would then meet in committee to discuss their individual preference orderings and to consolidate them into a final preference ordering of the line alternatives.

It is possible that two or more line alternatives may have a destination or origin zone in common. If this is the case, those alternatives will not be mutually exclusive. The final preference ordering will have to be revised with this in mind. Line alternatives which are not mutually exclusive will then have to be evaluated as a combination alternative against the preference ordering of the individual line alternatives.

A limited budget is available for the actual operating costs of the MTDP transportation grid. The panel

would next consider the preferred alternatives within the budget constraint. The panel accumulates the estimated total cost of each line alternative starting with the highest ranking alternative until the budget amount is exhausted. It is possible that the last preferred alternative may have a cost greater than the remaining budget. This will make it necessary to skip down the preference ordering to less preferred alternatives that can be financed out of the remaining funds.

The budget line alternatives thus selected would become the lines to be recommended for the MTDP experimental transportation grid. The MTDP staff has the responsibility for applying the bus line selection method and generating a set of preferred bus line recommendations. This requires application of the selection method to available data, evaluating bus route alternatives, and preparing the necessary documentation supporting recommended alternatives. The recommendations will have to be made subject to the financial constraints imposed by available funds. They will be accompanied by a complete schedule of bus services to meet normal shift times of employers to be served in the destination zones.

This bus route selection model provides a useful

degree of practical flexibility. Additional criteria for evaluating alternatives can be added if they are regarded as germane to the particular choice situation. Application of elements of the above approach to the recommendation of two bus routes linking the central City of St. Louis with the Meramec Industrial Valley made use of eight evaluation criteria (see Table II of Appendix III, Fenton Route recommendation.) The selection procedure allows consideration of all relevant information about each route alternative in addition to the explicit ranking of route alternatives on selected criterion variables. The Fenton route recommendation presents a case study of the route selection method in actual application. The variable omitted from consideration, "destination zone employment," is relevant in the choice among alternative destination zones. In the case of the Fenton route the destination zone was pre-selected for reasons given in Appendix III.

A final decision on the selection of any particular route may also be influenced by unique favorable or unfavorable ancillary factors or surrounding conditions. For example, planning the Fenton route provided a unique opportunity to serve the community of Meacham Park. On the other hand, a constraint on any route planned to serve

Fenton was the necessity to include service to the two Chrysler plants (the area's dominant employer). The decision to select a particular route cannot be made effectively without weighing the importance of such ancillary factors. This requires a knowledge about both the origin and destination zones of each route that goes beyond the formal planning criteria.

The MTDP staff have further qualified their procedure for choosing route recommendations by subjecting their choices to extensive scrutiny by other affected agencies. This is done both within the family of delegate agencies of the Human Development Corporation and with the officials of the Model City Agency and the other subcontractors. The hope is to arrive at a consensus recommendation which will receive the cooperative support of all agencies if implemented. Experience with the Fenton route recommendation should provide a test of this expectation. The Fenton route recommendation was submitted for official approval only after exhaustive intra- and inter-agency discussions.

Experience in making the Fenton route selection and planning decisions indicated the utility of additional information regarding specific employers in the

destination zone. Additional information, beyond gross employment and shift-time data, on specific employers can: 1) sharpen marginal decisions in choosing among alternative routes; 2) help in determining the number of buses needed to serve each route; 3) assist in the processes of scheduling bus timetables and stops; 4) aid job development and placement agencies in bringing destination zone employers and origin zone job seekers together; and 5) help guide promotional activities for the bus services.

A pilot questionnaire has been developed as an instrument for obtaining systematic information on relevant employer data. Until now, specific employer data have been obtained on a piecemeal basis when necessary. A reproduction of the proposed questionnaire is contained in Appendix V. Present plans are to enlist the cooperation of job developers from Work Opportunities Unlimited, a Human Development Corporation delegate agency, in field testing the questionnaire. It should provide valuable additional data for route planning. Systematic employer information should also provide a richer base against which to evaluate the success of the various lines after implementation.

5. Description of Basic Planning Data

The discussion in the preceding section indicated that the basic data for planning the demonstration project relate to population and employment. The problems involved in finding current reliable and valid local data on labor market variables were discussed in the first progress report. In summary, it became obvious to the MTDP staff that detailed current data on labor demand and supply for the geographic planning units we have to deal with are simply not available. The geographic unit for planning is the city or transportation block. A larger unit would be too gross for the detailed planning needed to design transportation corridors.

The only base population data available by city block are 1960 Census data. Even these data are not easily accessible. For instance, it took the U. S. Bureau of the Census approximately two months to prepare and deliver a computer tape with population figures by Census block for 1960; this was due in part to the difficulty of translating the data into a format amenable to processing on currently used computers. Other data used include a Missouri State Department of Highways sample survey of the 1965-66 population (by "trans-

portation zone") in the St. Louis SMSA and an East-West Gateway Coordinating Council record of total employment by "transportation zone" for the St. Louis SMSA of 1965.

The East-West Gateway Coordinating Council also produced a master indexing computer tape system to coordinate and aggregate "census block", "city block", "transportation block", and "transportation zone" data. This Geographic Master Index File was used by the MTDP staff to produce relevant block statistics on population and employment from the three population and employment tapes mentioned in the previous paragraph.

The basic method for producing the planning data that will be contained in the Mass Transportation Master File (MTMF) is outlined in Technical Appendix VI. Recent developments indicate that it may be necessary to adjust the procedure for processing the employment data to comply with restrictions on data disclosure; however, the end product of the MTMF will be total population and employment data by whatever aggregation of "transportation blocks" are desired for planning purposes.

Basic data on transportation travel time and distances for alternative bus routes are supplied upon

request by Bi-State. The MTDP planning staff first have to define the set of route alternatives to be considered before the estimates of time and distance can be made. The Bi-State estimates for the TEMPO/Northwest line have generally been quite accurate. Experience in planning the Fenton line recommendation has also demonstrated that prompt and accurate time and distance estimates are available.

6. Evaluation Phase

Evaluation of the St. Louis MTDP experimental transportation services will be related to three areas of system's performance:

- 1) Volume of ridership generated;
- 2) Financial performance; and
- 3) Analysis of passenger characteristics.

Some preliminary analysis has been made in each of the three areas of performance. The results are reported in Technical Appendices I and II of this report. These preliminary analyses, in addition to providing a base for periodic trend analysis, will help establish the final criteria for judging the significance of this experiment in the development of urban transportation systems.

6.1 Ridership and Financial Performance

Technical Appendix I contains an analysis of the ridership and financial performance of the TEMPO/Northwest line from its inception through December, 1968. A major difficulty in evaluating the ridership and financial performance of this project is related to the fact that it is superimposed on an existing bus transportation grid. There is, consequently, no satisfactory method available for separating its results completely from that of the rest of the System.

The problem of differentiation is complicated further by the fact that the same agency is providing both bus services. The revenues and costs of the two services are not independent and ridership on the TEMPO buses is to some extent a function of the Bi-State transportation system as a whole. The TEMPO transportation grid must, therefore, be evaluated as an extension of an existing bus service network. The important question is whether the TEMPO routes will be viable *additions* to the Bi-State transportation grid. Estimates are, therefore, necessary of the *additional revenues* versus the *additional costs* generated by the TEMPO bus services.

The problem of estimating marginal revenues and

costs for the project are discussed in Technical Appendix I. Although the cost and revenue measures used lack precision, the financial performance of TEMPO/Northwest over the first eight months has been less than optimal. It remains to be seen whether the long-run performance of the line will show an improved financial picture. A major problem is the length of the line. Near capacity ridership appears to be a necessity for financial success with cost so directly affected by mileage.

6.2 Analysis of Passenger Characteristics

The effectiveness evaluation is to be broader than a mere test of the economic feasibility of each line. The evaluation is intended to include an assessment of the general socio-economic impact that the transportation services make on the target area population.

A preferred bus service evaluation procedure would require a before-and-after study design of the target population. The HDC-City Plan Commission (CRP) survey of the socio-economic characteristics of St. Louis residents should provide a comparative data base for the bus line evaluation but it cannot be used as a direct frame for a follow-up study. An attempt to design a before-

and-after follow-up study in collaboration with Project Newcastle failed to gain administrative acceptance from the housing authorities. (See first progress report.)

The current plan is to base the evaluation study on the results of an extensive, on-bus, sample survey of MTDP bus passengers. The survey is geared to obtain information on volume of bus usage, passenger characteristics, reasons for bus travel, and changes in employment and earnings variables as a result of bus usage.

The Bi-State Development Agency provides the MTDP staff with daily counts of total ridership on each TEMPO bus. The same person may, of course, use several TEMPO buses in one day or over one week. In addition, completely different individuals may use the same buses on different days of the week. It is probable that a large population of TEMPO passengers are regular riders using the buses to and from work five days per week; however, the Bi-State ridership statistics, although quite suitable for measuring the general volume of bus usage, are not a proper basis for gathering information and making inferences about the personal characteristics of TEMPO passengers.

The information generated by the survey should provide before-and-after comparisons of socio-economic variables as they relate to the population of bus passengers. A comparison of the characteristics of the population of bus passengers with the socio-economic profiles generated by the CRP survey will, in turn, provide a means of estimating to what extent the bus services have influenced the target area population as a whole. Data from the HDC client data bank will be used where feasible to supplement the survey data. These comparisons should, for example, provide some insight into the effectiveness with which the TEMPO bus services are assisting the hard-core unemployed as opposed to simply serving better qualified workers who may already have had access to employment in the destination zones.

The on-bus survey questionnaire has already been designed, tested, and applied to a cross-section of summer-1968 TEMPO/Northwest passengers. The results of this survey are discussed in Technical Appendix II. Periodic cross-sectional surveys similar to the survey described in Technical Appendix II will serve to give a longitudinal appraisal of growth and change in the characteristics of TEMPO passengers over the entire experimental period. A copy of the final form of the on-

bus survey questionnaire is included in Technical Appendix V.

Coding instructions and punching and editing procedures for handling the survey data have been established. An interviewers' guide is in the developmental stage with the collaboration of the Staff Training Department of the Human Development Corporation. The Staff Training Department will be responsible for training HDC interviewers to conduct future periodic on-bus surveys.

The passenger profile obtained from the first periodic on-bus survey shows the unmistakable impact of seasonal variables on the composition of TEMPO ridership. Generalizations about the type of passenger served by TEMPO will have to take seasonality into consideration. It is obvious that a series of surveys will need to be made to get a valid picture of the influence of the TEMPO buses.

In addition to seasonal changes in the composition of TEMPO passengers, two other factors seem to produce significant additional variation in the volume and characteristics of TEMPO passengers. The first of these factors is the turnover resulting from substitution of other modes of transportation for bus transportation. There is

a strong suspicion that the TEMPO/Northwest line has lost considerable traffic to other modes of travel. This is a major research hypothesis that needs to be tested carefully. A bus service such as TEMPO may act as a catalyst in bringing workers and employers together without long-run benefit to the line itself. The worker, once he has a job, can, for example, become a member of a car pool or be financially able to drive an automobile to work.

The second factor is related to the ebb-and-flow in passengers associated with special training programs. The on-bus survey reported in Appendix II shows clearly that major users of TEMPO were young persons on special training programs. These training programs, governmental or private, have become a regular institution. It is quite possible that TEMPO ridership and passenger characteristics will be substantially affected by the status of employer training programs in the destination zones. A longitudinal approach to the analysis of TEMPO passengers is, therefore, imperative to the proper evaluation of the performance of the line.

The MTDP staff has decided upon a sampling design involving monthly, cross-sectional surveys of TEMPO

passengers. The weekly rate of passenger turnover is probably too small and unreliable to justify a weekly interview schedule. The on-bus surveys will be scheduled for the week including the twelfth day of each month or the first week thereafter, if the week of the twelfth includes a public holiday during the work week. Each interviewer will be supplied with an alphabetical listing of past respondents. This list will contain the identification number, full name, and address of each previous respondent. If a passenger has already been interviewed, the interviewers will check the address, ask for any other change in status, and then check the passenger's name on the list. The data files of these passengers will be retrieved and added to the statistics for the current period.

The sampling design for the survey requires that every effort be made to interview everyone using the buses during the survey week. The number of individuals riding the TEMPO/Northwest buses have probably never exceeded a total of 200 per week. It is unlikely that passenger volume on new TEMPO lines will quickly exceed such numbers. In dealing with small weekly populations of passengers, the likelihood of sampling error in inter-monthly comparisons of detailed trends in passen-

ger characteristics is extremely great if fewer than all of the passengers for the sample week are interviewed. In order to get good comparative statistics for studying passenger characteristics and passenger turnover and the resultant changes in passenger characteristics, it is imperative that virtually all passengers be interviewed during each survey period. Since the interviewers will have a whole week for conducting on-bus interviews, this approach should be quite feasible.

7. Revisions in MTDP Activity Network

The MTDP staff, at the inception of the project, designed an activity network to guide and coordinate their dual role as project planners and evaluators. This original network included time estimates based on Program Evaluation and Review Technique (PERT) methodology. The time estimates have been dropped from a revised and expanded version of the MTDP activity network.

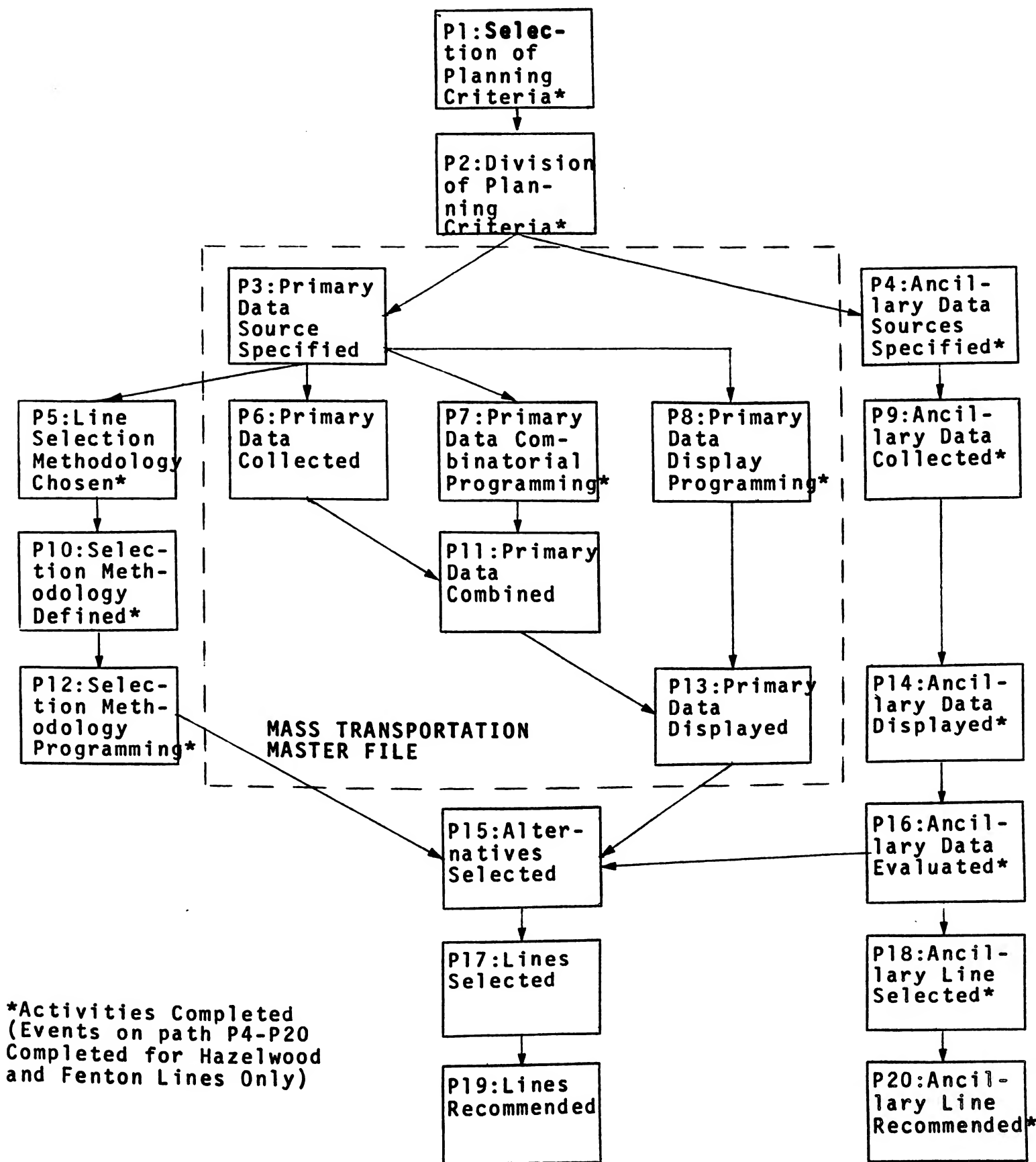
The MTDP staff experienced considerable, unanticipated delays along some of the MTDP activity paths as a result of factors beyond their direct control. The primary delays resulted from late delivery of planning input data requested from secondary sources. These delays involved months rather than days and made the ori-

ginal time estimates obsolete. In revising the activity network it was, therefore, decided to temporarily drop the time estimates until more direct control over the timing of planned events could be established.

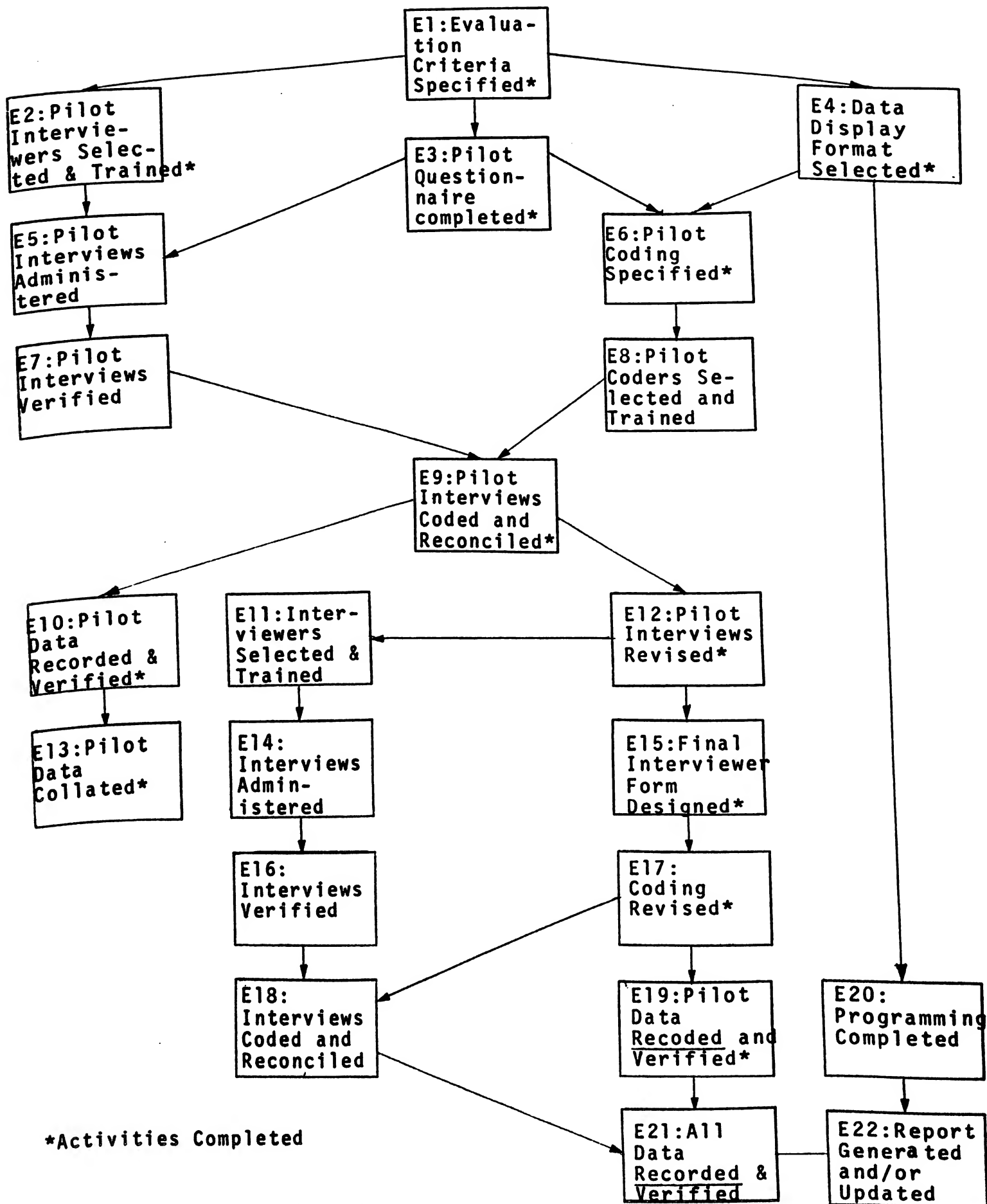
The new activity network for the MTDP staff is reproduced in Exhibits 6 and 7. Two lines of activity must be advanced to completion in order to meet the obligations of the MTDP staff under their work program. Exhibit 6 diagrams the sequence of activities involved in the planning phase of the MTDP work program. Exhibit 7 displays the sequence of activities related to the completion of the evaluation phase of the MTDP work program. The planning phase will be completed earlier than the evaluation phase of the study.

Many of the activities along both major paths have already been completed and others are in a stage of partial completion. (The activities that are completed at present are marked with an asterisk.)

The activity paths depicted in Exhibits 6 and 7 are, in the main, self-explanatory. A number of additional remarks may clarify remaining problems of interpreting the two flow diagrams. The activity networks of Figures 6 and 7 portray only the planning and evaluation phases of the total work responsibilities of the MTDP staff. The



PLANNING PHASE ACTIVITY NETWORK



EVALUATION PHASE ACTIVITY NETWORK
EXHIBIT 7

project staff also have major administrative and report writing responsibilities relative to their planning and evaluation activities. These functions are continuing obligations that permeate all MTDP activities and do not lend themselves to exposition by the network technique.

The design of the TEMPO/Northwest service and the Fenton route recommendation were made on an individual basis. In making these recommendations the MTDP staff departed from the general model they developed for planning the MTDP transportation grid. The reasons for this departure from the general route selection method are documented in the individual recommendations. Events P-18 and P-20 were included in the planning phase activity network to accomodate these deviations from the general route planning model.

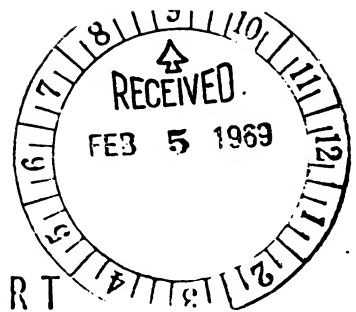
8. Job Development and Placement Efforts

The Human Development Corporation has attempted to assist the TEMPO line by directing special attention to job development and placement in the Hazelwood area destination zone. As noted previously (Exhibit 1) a meeting of employers in the area was called before the line began in order to explain its purpose and indicate

that many of the concerns would be called upon by job developers. This was followed by an intensive effort on the part of Work Opportunities Unlimited, an HDC delegate agency, to develop new jobs in the area. A second such effort was also made.

As the job development effort proceeded, a system of identifying all relevant job orders called into the HDC "job bank" was instituted. At the same time placement workers in HDC's neighborhood stations were alerted to the new bus service and provided with schedules and other supporting material. A weekly report, summarizing these efforts, is generated by HDC's Data Center. The report for February 3, 1969 (Exhibit 8) is illustrative of the format.

The first question that a reader might ask upon glancing at these figures is "What about the Missouri State Employment Service?" "Aren't they placing any people out there?" In point of fact, they are - but have steadfastly failed to cooperate in providing HDC with this data. Efforts are currently being made by the Model City Agency to overcome this difficulty. More substantive questions, however, are:



DATA CONTROL CENTER

WEEKLY TEMPO JOB REPORT

DATE: 2-3-69 REPORT FOR WEEK OF 1-27-69 THRU 1-31-69

The weekly TEMPO job development and placement activity as reported to the JOB BANK UNIT at the Data Control Center is as follows:

	This Week	Cumulative*
1. JOBS DEVELOPED:		
a) By W.O.U.	6	191
b) By Urban League	0	19
c) By M.S.E.S.	0	0
TOTAL	6	210
2. JOB REFERRALS:		
a) On W.O.U. Jobs	1	294
b) On Urban League Jobs	0	5
c) On M.S.E.S. Jobs	0	0
TOTAL	1	299
3. JOB PLACEMENTS:		
a) On W.O.U. Jobs	0	85
b) On Urban League Jobs	0	0
c) On M.S.E.S. Jobs	0	0
TOTAL	0	85
4. JOBS STILL OPEN THIS DATE:		
a) W.O.U.	23	* Represents total in each category since May 16, 1968
b) Urban League	5	
c) M.S.E.S.	0	
TOTAL	28	

The following actions on TEMPO job orders were reported through the Job Bank Unit of the Data Control Center:

[illegible]

EXHIBIT 8 (Cont'd.)

1. Why have only 28% of the applicants been placed in jobs?
2. Why are there still open jobs if there are unemployed people?

The answers to the first question are rather simple. Most employers in the area - and especially the larger employers - hire the best qualified applicants. These are not usually ghetto residents. There has been little if any cooperation on giving preference to hard-core unemployed, and inasmuch as the companies concerned can meet their needs without these people, such preference would seem to be a necessity if they are to be hired. A notable exception to this trend has been the cooperation of Diversified Metals, Incorporated. It is the feeling of the MTDP staff that unless real cooperation is obtained from the large manufacturers the project can never be an economic success.

The answer to the second question is that the jobs remaining open are those in the \$1.65 - \$2.00 range. Jobs in this range are available closer to the central city, and are naturally given preference by inner-city residents. Further, many employment counselors hesitate to refer adult men to jobs in this salary range with

little chance for advancement. A contributing factor is that some of the jobs are in the higher ranges, but require training that the typical applicant does not have — and which the companies are unable or unwilling to provide. Intensive manpower training efforts are another prerequisite for the success of a project of this type.

Future efforts at HDC will be designed to concentrate attention on these problems. It should be noted that the Fenton line recommendation (Technical Appendix III) was based partially on the fact that a large-scale training program is underway at the Chrysler plant there. In addition, the Model City Agency has recently assumed an active role in soliciting support from a broad range of community agencies involved in job development and placement.

TECHNICAL APPENDIX I

Review of Ridership and Financial Performance of MTDP TEMPO/Northwest Bus Services, April 29 - December 31, 1968

Ideally, the financial performance of a project such as this should be evaluated against actual flows of costs and revenues generated by the project. Where the project is superimposed on an existing transportation network, this requires identification of the additional costs and revenues generated by the project. It is notoriously difficult to separate such incremental costs and revenues from the total system's costs and revenues. For example, the new bus services may to some extent be used as a substitute for other bus services by regular users of the bus system. A part of the revenue accruing to the new lines should then properly be credited to the previously existing services. On the cost side, it is possible that some administrative staff assigned to this project, for example, were already employed by the existing system and are receiving no additional remuneration for their work on the project. Costs assigned to the project should strictly not include a share for such services and previously existing rent, taxes, insurance, and other overhead expense.

As a result of the difficulties involved in incremental cost and revenue accounting, the accounting for the MTDP bus services was based on negotiated formulae

and procedures to approximate actual flows of revenues and costs to the project.

The accounting for the costs accruing to the bus services was based on an average cost per mile formula. In the third quarter of 1967, the Bi-State Transit System reported average operating costs per bus mile of 95.24 cents to the Interstate Commerce Commission. Since this figure includes an averaging of overhead expenses for the total system, the additional costs of an increment in service miles would, as a rule, tend to be lower than the average operating costs per mile. In view of the above, it was agreed that the Bi-State Development Agency would charge the City of St. Louis the following costs per mile for all bus miles chargeable to the project:

Until 2/29/68	91.91 cents per bus mile
3/1/68 to 8/30/68	92.86 cents per bus mile
9/1/68 and thereafter	93.97 cents per bus mile

The cost figures reported in this section are calculated on the basis of the above basic cost of service. This, in effect, means that there is an invariant direct relationship between mileage and cost for this project for each time period stated above. The 91.91 cents per bus mile rate was never applied since the first buses started

running on April 29, 1968.

A computational formula for TEMPO bus service revenues was negotiated between the Bi-State Development Agency and the St. Louis Model City Agency representing the City of St. Louis. The negotiated share of TEMPO revenue accruing to the project applies to services to the Hazelwood Industrial Complex only. Additional revenue formulas will be negotiated to apply to other TEMPO lines. The basic accounting equation agreed upon can be described as follows:

$$\begin{aligned} \text{TOTAL NET REVENUE} = & 50¢ (\text{C.R.}) + 5¢ (\text{T.I.}) + 60¢ (\text{P.S.}) \\ & + 15¢ (\text{P.H.}) + 25¢ (\text{T.C.}) - 30¢ (\text{T.I.}) \end{aligned}$$

where:

C.R. = number of cash riders;

T.I. = number of transfers issued;

P.S. = number of passes sold;

P.H. = number of passes honored;

T.C. = number of transfers collected.

In practice, two of the above variables are not measured directly in determining the amount of adjusted gross revenue. The credit given for passes honored during weekdays is based on a count of passes honored on one,

randomly-selected, day of the week in question. A tally is not kept of the number of cash riders, only of transfer riders. In practice, therefore, farebox revenue is adjusted by an estimate of revenue from gold passes honored and increments to revenue and cost calculated from transfers issued and collected and passes sold.

In September, 1968 the Bi-State Development Agency, for security reasons, discontinued the sale of weekly passes on buses. Bi-State passes are now sold through retail outlets throughout the transit area. This evidently has resulted in a reduction in the use of weekly passes by riders. Table I-1 shows that the proportion of total TEMPO revenue obtained from cash ridership has increased substantially while revenue from passes honored has declined substantially. The MTDP has, nevertheless, lost the 60 cents per passenger revenue generated by the sale of passes on our buses.

The total revenue generated during the first eight months of TEMPO operations is detailed in Table I-1. Table I-2 contains a summary of monthly ridership, revenues and costs for the project bus services during the same period. The sharp upward trend in revenues during the first four months of the project can probably be ascribed to two factors, the effects of the second factor

being more important than the effects of the first factor:

- 1) an initial upsurge in ridership as a result of the novelty of the service;
- 2) a seasonal increase in ridership associated with temporary summer employment in youth employment and training programs.

September and October ridership reflect the seasonal decrease in summer employment, while the ridership for November shows the effects of a planned reduction in service.

The bus services to the Hazelwood industrial complex were reduced from 28 to 16 buses on weekdays and all weekend buses were discontinued as of October 28, 1968. This service reduction was affected on the basis of an analysis of the performance of the TEMPO buses during the four-week period from August 5, 1968 to September 1, 1968 (see memorandum attached as Appendix IV).

It is quite clear from Table I-2 that the revenue from the TEMPO buses had not been sufficient to cover the costs of service. It should be pointed out that although the cash fare on the Hazelwood buses is 50 cents, average revenue per passenger accruing to the project was 28 cents

during November. TEMPO revenue does, therefore, not reflect the actual cost to riders of the bus services. This discrepancy results from the use of passes, transfers and the revenue sharing formula agreed to between the Model City Agency and the Bi-State Development Agency. It has been suggested elsewhere that, as a result of changed conditions, the formula be renegotiated.

The following is a monthly by run analysis of the performance of the TEMPO system from August through December. The analysis was not begun until last August due to incomplete data for the preceding months. At this time twenty-eight (28) runs were in operation, and continued until October 28, when twelve runs were discontinued, based on the performance evaluation presented in Appendix IV. (These twelve runs are marked with asterisks in Tables I-3, I-4, and I-5 and Exhibits I-1 and I-2.) It should be noted that the average revenue per line for these twelve lines from August 1 until discontinued was \$.0083, well below the average revenue per line of the total service for the same period of \$.0455, or of the sixteen lines maintained in operation of \$.0739.

In general, adjusted total revenue per mile declined from August through October, due to the seasonal decline in total ridership:

August,	\$0.0568 per mile
September,	\$0.0404 per mile
October,	\$0.0397 per mile
November,	\$0.0500 per mile
December,	\$0.0456 per mile

The November increase in adjusted total revenue per mile resulted from the decision to eliminate the twelve low-performance lines from the TEMPO service. December revenue per mile decreased slightly as a result of some loss in ridership during the holidays. Exhibits I-1 and I-2 depict the revenue per mile data of Table I-3 in bar-graph form. Revenue per mile varies greatly. It correlates directly with differences in ridership, since revenue per line was derived by allocating total revenue per time period according to ridership per bus line.

On this basis, the 6:35 a.m. outbound and the 4:33 p.m. inbound were by far the most profitable runs. Together they averaged revenue per mile of \$0.2481 and accounted for 49 percent of revenue for the total service over the five-month period.

Three outbound runs - 5:10, 5:23, and 5:41 a.m., and two inbound - 2:57 and 3:34 p.m., together show a revenue performance which, while not approaching the above

runs, is substantially greater than the remainder of the service. Over the five month period, average revenues per mile of these five lines was \$.0610, and they contributed 30 percent of total revenue. The seven most profitable lines together thus accounted for 80 percent of the revenue for the entire service.

The remaining nine lines, accounting for 20 percent of total revenue over the five month period, had an average revenue per mile of \$.0311. However, these figures are not a true measure of their value. Three of the nine lines - the outbound 9:01 and 1:01, and the inbound 12:00 noon - are designed to accomodate job applicants, and are timed to coincide with the hours of job personnel interviewers at various companies. It is hoped these riders will become regular passengers on other lines.

One of the problems faced by TEMPO in attempting to reduce the cost of the project has been that of "dead-head" mileage. The routes of the bus lines take them considerable distances from most of the regular lines operated by the Bi-State system. This has necessitated including a great deal of dead-head mileage in the TEMPO lines - mileage over which no passengers are carried from

the garage to the route and/or from the end of the route to the garage. Some of the dead-head mileage can be avoided by integrating empty buses to carry passengers on regular routes. Bi-State has done an excellent job of trying to reduce TEMPO dead-head mileage by this means; however, this is difficult, and 27 percent of total TEMPO mileage is still dead-head mileage on which no revenue is generated. This means that 27 percent of the cost of running the TEMPO service, as constituted since November 4, is for dead-head mileage.

Table I-5 shows monthly revenue per passenger mile adjusted by eliminating dead-head mileage. This revenue per route mile calculation shows the revenue performance of the TEMPO service on the assumption that all dead-head mileage is eliminated from the system. While dead-head mileage could never be entirely eliminated, it is conceivable that once a decision is made to continue a TEMPO line permanently, dead-head mileage can be substantially reduced.

AMOUNT IN DOLLARS									
Revenue Category	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	
Farebox Revenue	267.97	729.02	638.79	626.34	662.28	685.63	484.69	462.68	
Transfers Collected	2.70	8.80	7.05	4.15	3.40	6.95	5.50	4.20	
Passes Sold	12.00	36.60	88.80	72.60	--	--	--	--	
Passes Honored	55.95	243.90	630.00	574.50	182.85	187.35	205.05	192.15	
TOTAL GROSS REVENUE	338.62	1,018.32	1,364.64	1,277.19	848.53	879.93	695.24	659.03	
Less Transfers Issued	31.80	91.50	80.70	57.60	52.55	41.40	50.40	42.60	
ADJUSTED TOTAL REVENUE	306.82	926.82	1,283.94	1,219.89	795.98	838.53	644.84	616.43	

REVENUE CATEGORIES AS A PERCENTAGE OF ADJUSTED TOTAL REVENUE

Farebox Revenue	87.33	78.6	49.75	51.34	83.2	81.76	75.16	75.00	
Transfers Collected	8.7	.9	.54	.34	.42	.82	.85	.68	
Passes Sold	3.91	3.9	6.91	5.95	--	--	--	--	
Passes Honored	18.23	26.3	49.06	47.09	22.97	22.34	31.79	31.17	
TOTAL GROSS REVENUE	110.34	109.8	106.28	104.12	106.59	104.93	107.81	106.91	
Less Transfers Issued	10.34	-9.8	-6.28	-4.72	-6.59	-4.93	-7.81	-6.91	
ADJUSTED TOTAL REVENUE	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	

Total Monthly Revenue of MTDP Bus Services by Revenue Categories

May through December, 1968

TABLE 1-1

Month (1968)	Total Ridership	Total Cost	Adjusted Total Revenue	Net Loss	Cost Per Rider	Revenue Per Rider	Net Loss Per Rider
May ¹	--	\$14,738.65	306.82	\$14,431.83	--	--	--
June	3,076	15,535.01	926.82	14,608.19	5.05	.30	4.75
July	5,410	17,308.92	1,283.94	16,024.98	3.20	.24	2.96
August	5,095	19,928.50	1,219.89	18,708.61	3.91	.24	3.67
September	2,564	18,491.23	795.98	17,695.25	7.21	.31	6.90
October ²	2,925	19,800.79	838.53	18,962.26	6.77	.29	6.48
November	2,313	12,873.30	644.84	12,228.46	5.57	.28	5.29
December	2,059	12,700.61	616.43	12,084.18	6.17	.30	5.84

¹April 29 - May 31, 1968. Ridership count not complete

²Service reduced from 28 to 16 buses on weekdays on October 28, 1968.
All weekend service also discontinued.

Summary of Monthly Ridership, Revenues and Costs of MTDP
Bus Services - May - December, 1968

TABLE I-2

Outbound ¹	Aug.	Sept.	Oct.	Nov.	Dec.	Avg. ³	Inbound ²	Aug.	Sept.	Oct.	Nov.	Dec.	Avg. ³
5:10 a.m.	.0956	.0505	.0329	.0343	.0226	.0474	*7:00 a.m.	.0333	.0218	.0175	-	-	.0250
5:23 a.m.	.1187	.0748	.0703	.0360	.0404	.0687	*8:07 a.m.	.0066	.0055	.0066	-	-	.0062
5:41 a.m.	.0692	.0681	.0682	.0399	.0361	.0566	*8:34 a.m.	.0021	.0031	.0029	-	-	.0026
6:35 a.m.	.3791	.2042	.2398	.1719	.1425	.2299	12:00 Noon	.0200	.0105	.0091	.0134	.0095	.0125
6:53 a.m.	.0444	.0465	.0439	.0494	.0644	.0495	2:57 p.m.	.1041	.0924	.0973	.0665	.0612	.0848
9:01 a.m.	.0129	.0190	.0306	.0263	.0265	.0231	3:04 p.m.	.1028	.0235	.0171	.0067	.0110	.0329
1:01 p.m.	.0158	.0225	.0171	.0076	.0102	.0146	3:34 p.m.	.0912	.0586	.0413	.0282	.0180	.0478
*1:38 p.m.	.0079	.0140	.0166	--	--	.0126	4:33 p.m.	.3745	.2259	.2004	.2946	.2375	.2664
*2:17 p.m.	.0033	.0098	.0078	--	--	.0068	5:06 p.m.	.0270	.0452	.0630	.0589	.0231	.0434
2:53 p.m.	.0161	.226	.0191	.0224	.0125	.0184	*5:40 p.m.	.0073	.0107	.0068	--	--	.0082
3:11 p.m.	.0175	.0307	.0354	.0087	.0097	.0206	*11:05 p.m.	.0054	.0186	.0212	--	--	.0146
3:36 p.m.	.0212	.0364	.0246	.0222	.0160	.0239	*12:11 p.m.	.0029	.0065	.0051	--	--	.0047
*9:42 p.m.	.0032	.002	.0016	--	--	.0023	*1:05 a.m.	.0086	.0080	.0000	--	--	.0057
*10:48 p.m.	.0166	.0084	.0073	--	--	.0127							
*11:59 p.m.	.0000	.0000	.0000	--	--	.0000							

¹ Runs from City of St. Louis to County destination

² Runs from County to City of St. Louis

³ Weighted average over 5-month period (August through December)

* Bus runs discontinued, October 28

Adjusted Total Monthly Revenue per Mile for Each
TEMPO Bus Run - August through December, 1968 (in Dollars)

TABLE I-3

Outbound ¹	Aug.	Sept.	Oct.	Nov.	Dec.	Avg. 3	Inbound 2	Aug.	Sept.	Oct.	Nov.	Dec.	Avg. 3
5:10 a.m.	.8330	.8441	.9068	.9054	.9171	.8814	* 7:00 a.m.	.8953	.9064	.9222	-	-	.9064
5:23 a.m.	.8099	.8210	.8694	.9037	.8993	.8603	* 8:07 a.m.	.9220	.9331	.9331	-	-	.9288
5:41 a.m.	.8594	.8705	.8715	.8998	.9036	.8804	* 8:34 a.m.	.9265	.9376	.9368	-	-	.9333
6:35 a.m.	.5495	.5606	.6999	.7678	.7972	.6744	12:00 Noon	.9086	.9197	.9306	.9263	.9302	.9230
6:53 a.m.	.8842	.8953	.8958	.8903	.8753	.8881	2:57 p.m.	.8245	.8356	.8424	.8732	.8785	.8507
9:01 a.m.	.9157	.9268	.9091	.9134	.9132	.9154	3:04 p.m.	.8259	.8369	.9226	.9330	.9287	.8895
1:01 p.m.	.9128	.9239	.9226	.9321	.9295	.9239	3:34 p.m.	.8374	.8485	.8984	.9115	.9217	.8834
*1:38 p.m.	.9207	.9318	.9231	-	-	.9250	4:33 p.m.	.5541	.5652	.7393	.6451	.7022	.6428
*2:17 p.m.	.9253	.9364	.9319	-	-	.9309	5:06 p.m.	.9016	.9127	.8767	.8808	.9166	.8973
2:53 p.m.	.9125	.9236	.9206	.9173	.9272	.9201	* 5:40 p.m.	.9213	.9324	.9329	-	-	.9285
3:11 p.m.	.9111	.9222	.9043	.9310	.9300	.9192	* 1:05 p.m.	.9232	.9343	.9185	-	-	.9253
3:36 p.m.	.9074	.9185	.9151	.9175	.9237	.9163	* 12:11 p.m.	.9257	.9368	.9346	-	-	.9321
*9:42 p.m.	.9254	.9365	.9381	-	-	.9320	* 1:05 a.m.	.9200	.9311	.9397	-	-	.9297
*10:48 p.m.	.9120	.9231	.9324	-	-	.9215							
*11:59 p.m.	.9286	.9397	.9397	-	-	.9356							

¹ Runs from City of St. Louis to County Destination

² Runs from County to City of St. Louis

³ Weighted Average over 5-month Period (August through December)

* Bus runs discontinued October 28, 1968

Net Cost per Mile for Each TEMPO Bus Run for the
Months August through December, 1968 (In Dollars)

TABLE I-4

Outbound ¹	Aug.	Sept.	Oct.	Nov.	Dec.	Avg. ³	Inbound ²	Aug.	Sept.	Oct.	Nov.	Dec.	Avg. ³
5:10 a.m.	.1675	.0975	.0588	.0605	.0399	.0852	*7:00 a.m.	.0217	.0235	.0222	--	--	.0224
5:23 a.m.	.2177	.1509	.1342	.0661	.0741	.1299	*8:07 a.m.	.0085	.0074	.0104	--	--	.0086
5:41 a.m.	.0869	.0941	.0891	.0763	.0691	.0832	*8:34 a.m.	.0039	.0067	.0057	--	--	.0053
6:35 a.m.	.4627	.2741	.3044	.3484	.2888	.3367	12:00 noon	.0319	.0185	.0150	.0242	.0172	.0213
6:53 a.m.	.0763	.0968	.0864	.0935	.1220	.0946	2:57 p.m.	.1150	.1124	.1118	.0717	.0660	.0959
9:01 a.m.	.0204	.330	.0501	.0414	.0418	.0374	3:04 p.m.	.1791	.0427	.0310	.0114	.0188	.0578
1:01 p.m.	.0192	.0299	.0222	.0120	.0123	.0191	3:34 p.m.	.1178	.0832	.0555	.0555	.0355	.0696
*1:38 p.m.	.0079	.0154	.0174	--	--	.0133	4:33 p.m.	.4719	.3132	.2626	.3649	.2943	.3411
*2:17 p.m.	.0060	.0194	.0102	--	--	.0116	5:06 p.m.	.0334	.0614	.0810	.0716	.0281	.0551
2:53 p.m.	.0201	.0440	.0352	.0279	.0156	.0284	*5:40 p.m.	.0102	.0149	.0084	--	--	.0111
3:11 p.m.	.0216	.0417	.0454	.0108	.0119	.0265	*11:05 p.m.	.0069	.0260	.0283	--	--	.0198
3:36 p.m.	.0258	.0311	.0311	.0404	.0291	.0313	*12:11 p.m.	.0037	.0092	.0068	--	--	.0064
*9:42 p.m.	.0040	.0026	.0026	--	--	.0031	*1:05 p.m.	.0110	.0112	.0000	--	--	.0076
*10:48 p.m.	.0227	.0116	.0116	--	--	.0156							
*11:59 p.m.	.0000	.0000	.0000	--	--	.0000							

1 - Runs from City of St. Louis to County destination

2 - Runs from County to City of St. Louis

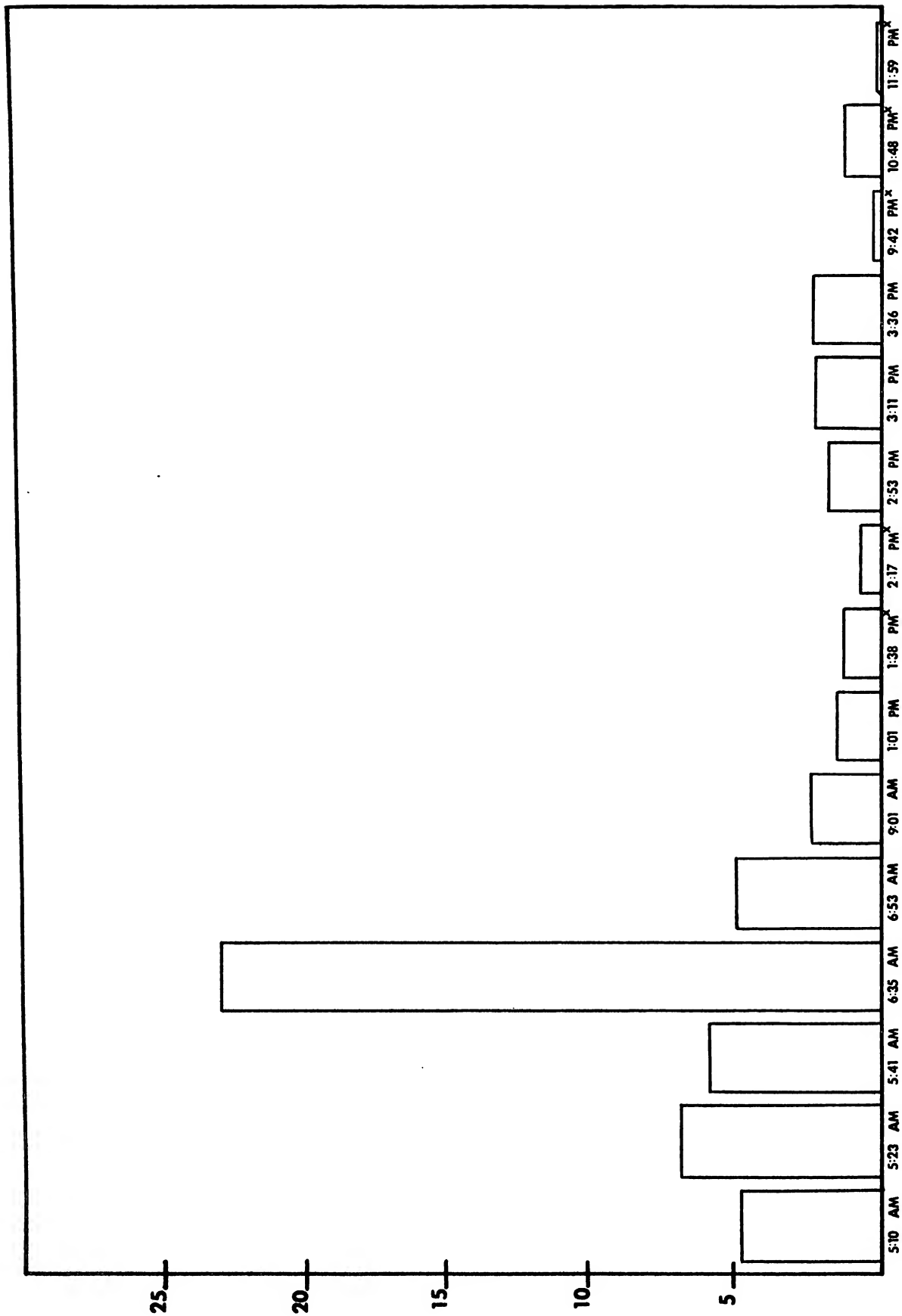
3 - Weighted Average over 5-month period (August through December)

Adjusted Total Monthly Revenue per Route⁴ Mile for Each TEMPO Bus Run - August through December, 1968

4 - Miles traveled while on actual route, discounting miles traveled to and from garage

* - Bus runs discontinued, October 28, 1968

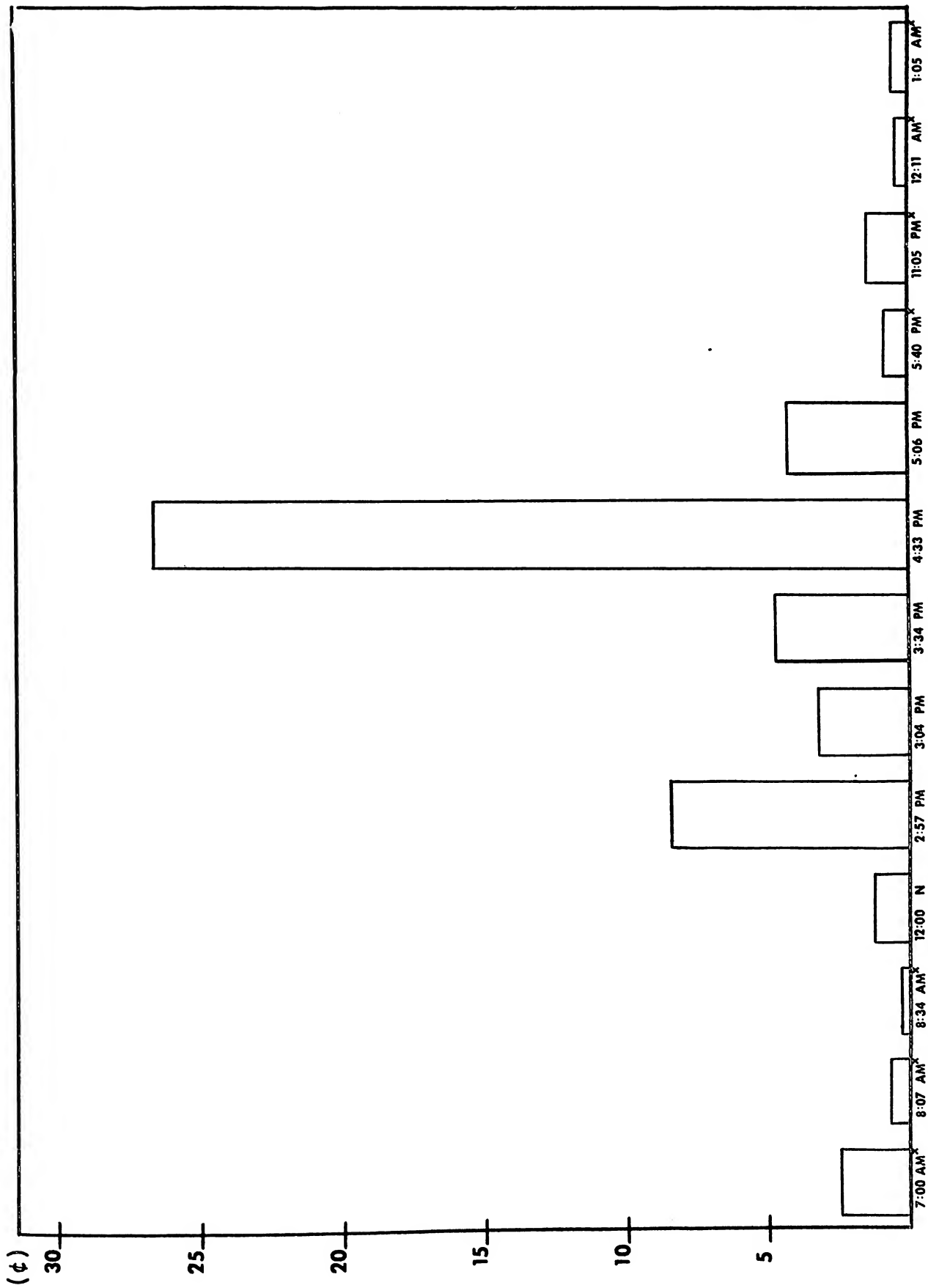
TABLE I-5



x - Bus runs discontinued October 28, 1968

Average Monthly Revenue per Mile, August through December, 1968 (¢) Outbound

EXHIBIT I-1



x - Bus runs discontinued, October 28, 1968

Adjusted Total Monthly Revenue per Mile. Average August through December (¢) Inbound

TECHNICAL APPENDIX II

**Passenger Profile of TEMPO/Northwest
Line - Summer, 1968**

The MTDP pilot line between the City of St. Louis and the Hazelwood industrial area was inaugurated on April 29, 1968. Ridership on the line, as anticipated, grew gradually, then demonstrated a seasonal peak during the summer months followed by a reduced level of ridership during the last quarter of 1968. The aggregate pattern of total ridership is analyzed in detail in another section of this report. Although total ridership is an important measure of traffic volume, it is replete with double counting of individual passengers who took more than one ride during the reporting period. The purpose of this section of the report is to sketch a profile of the types of individuals who patronize the TEMPO buses. The passenger statistics presented below, therefore, treat each passenger as a single observation.

Since MTDP ridership showed an obvious seasonal component, the passenger profile emerging from the present statistics represents a cross-section of "summer" passengers on the TEMPO line. In particular, the basic data relate to TEMPO passengers who were interviewed through an on-bus survey during the period July 17 through July 26, 1968. The discussion of ridership characteristics which follow must be evaluated within

this context.

The survey questionnaire was pre-tested on an earlier sample of passengers and will be used in all further on-bus surveys. A copy of the final questionnaire is exhibited in Technical Appendix V. The July 17-26 period was selected for the first complete passenger survey when it appeared that the initial growth in TEMPO passengers had attained a plateau. It was unfortunate that the Ford Motor Company plant in Hazelwood initiated a plant shut-down coincident with the survey period. The full effect of the shut-down on the results of the survey could not be measured. The shut-down did deflate the total of passengers carried during the period.

The MTDP staff attempted to interview all the individuals who used a TEMPO bus during the survey period. It was, however, impractical to have interviewers cover every bus trip during the period. It was particularly difficult to arrange for interviewing on the employment buses during the middle of each day. It is possible that several persons who used these buses for job search were missed by the interviewers.

A total of 134 TEMPO passengers were successfully interviewed during the summer survey period. These pas-

sengers, as intimated above, probably represent a good cross-section of those types of individuals who made fairly regular use of the TEMPO buses during the summer of 1968. The respondents probably under-represent occasional passengers and members of the Ford Motor Company.

TEMPO PASSENGERS BY METHOD OF FARE PAYMENT - SUMMER, 1968		
<u>Type of Fare</u>	<u>Number</u>	<u>Percent</u>
Cash	53	39.6
Pass	<u>81</u>	<u>60.4</u>
TOTAL	134	100.0

TABLE II-1

The majority of TEMPO passengers, about 60 percent, make use of passes in paying for their rides (see Table II-1.) This information underscores the importance of adjusting the revenue formula used by the Bi-State Development Agency in sharing pass revenues with the MTDP (see Technical Appendix I evaluating the financial performance of the MTDP.) A high proportion of pass riders also indicates a high proportion of regular passengers.

**FREQUENCY OF RIDERSHIP OF TEMPO
PASSENGERS - SUMMER 1968**

A. Trips last week (One direction):	<u>Number</u>	<u>Percent</u>
0 trips	25	18.7
1 - 4 trips	15	11.2
5 or more trips	93	69.4
No response	<u>1</u>	<u>.7</u>
	134	100.0
 B. Round trip Rider:		
Yes	102	76.1
No	<u>32</u>	<u>23.9</u>
	134	100.0

TABLE II-2

Table II-2 indicates that 69 percent of the responding passengers made at least five trips between the City of St. Louis and Hazelwood during the week preceding the survey week. The statistics in Table 2 suggest a relatively high proportion of regular riders. The statistics in Table II-3 show the reason each passenger gave for making the trip. These figures support the proposition that most TEMPO passengers are riding the buses in the course of their work routine. 93 percent of the passengers

made their trips in connection with work. A substantial core of TEMPO ridership during the summer of 1968 can be considered regular riders on their way to or back from work. According to the survey only about 1.5 percent of passengers were seeking work. This finding, as indicated before, probably understates the actual proportion of work seekers among TEMPO passengers.

TEMPO PASSENGERS BY REASON FOR USING BUS - SUMMER 1968		
Reason for Trip	Number	Percent
Work	125	93.3
Looking for Work	2	1.5
Shopping	4	3.0
Other	<u>3</u>	<u>2.2</u>
	134	100.0

TABLE II-3

Table II-4 contains a summary of selected personal characteristics of the responding TEMPO passengers. These data indicate the passengers to be preponderantly male, black, and in the younger age brackets. Two-thirds of the passengers also were found to be without valid driver's licenses.

**SELECTED PERSONAL CHARACTERISTICS
OF TEMPO PASSENGERS - SUMMER 1968**

Characteristics:	Number	Percent
Sex:		
Male	97	72.4
Female	37	27.6
Race:		
Negro	120	89.6
Other	14	10.4
Age:		
18 years or under	68	50.7
19 - 24 years	43	32.1
25 - 29 years	8	5.9
30 - 34 years	5	3.7
35 - 39 years	1	.7
40 - 44 years	3	2.2
45 years or over	5	3.7
No response	1	.7
Valid driver's license		
Yes	44	32.8
No	<u>90</u>	<u>67.2</u>
TOTAL	134	100.0

TABLE II-4

This information tends to support the argument that the bus service was of vital importance to a majority of the passengers in providing them with a transportation link to their employment.

The passengers were asked about alternative means of transportation that might have been available as a substitute for taking the TEMPO bus. Their responses to this question are summarized in Table II-5. More than a third of the respondents either knew of no alternative

ALTERNATIVES TO TEMPO BUSES SELECTED BY TEMPO PASSENGERS - SUMMER 1968		
<u>Alternative Transportation</u>	<u>Number</u>	<u>Percent</u>
Drive	30	22.4
Car pool	30	22.4
Another bus	20	14.9
Other means	2	1.5
Would not make trip	30	22.4
Don't know	<u>22</u>	<u>16.4</u>
	134	100.0

TABLE II-5

means or felt they would not be able to make the trip in another way. The dependency of this particular group of passengers on the TEMPO buses is further emphasized by

the response of another 15 percent that they would use another bus. Accessibility to the area on other bus routes is extremely inconvenient. It seems that over 50 percent of the passengers would have had difficulty maintaining their current employment without the TEMPO bus service.

Table II-6 highlights major characteristics of the employment of TEMPO passengers during summer, 1968. The statistics emphasize the importance of the McDonnell-Douglas Corporation as an employer during the summer period. In fact, all the statistics on passengers are strongly influenced by two youth summer employment programs undertaken by McDonnell-Douglas. Seventy-eight percent of the responding TEMPO passengers were in the employ of this single employer. The contribution of the Ford Motor Company plant in Hazelwood to TEMPO ridership was, as indicated, not adequately reflected by this survey.

Most employed TEMPO passengers had full-time jobs. Only four respondents indicated a less-than-full-time weekly work schedule. It should, however, be noted that many of these jobs were temporary summer jobs in training, clerical, or service positions. The distribution of the

**SELECTED CHARACTERISTICS ON THE EMPLOYMENT
STATUS OF TEMPO PASSENGERS - SUMMER 1968**

<u>Characteristic</u>	<u>Number</u>	<u>Percent</u>
Employer:		
McDonnell-Douglas	105	78.4
Other	20	14.9
Not Applicable	9	6.7
Hours of Work:		
Full Time	121	90.3
Part Time	4	3.0
Not Applicable	9	6.7
Type of Work:		
Clerical and Sales	51	38.1
Trainees	36	26.9
Service Occupations	12	9.0
Not Applicable	9	6.7
Hourly Wage Rate:		
\$1.00-1.49	32	23.9
\$1.50-1.99	56	41.8
\$2.00-2.49	10	7.5
\$2.50-2.99	10	7.5
\$3.00 and over	15	11.1
No Response	2	1.5
Not Applicable	<u>9</u>	<u>6.7</u>
TOTAL	134	100.0

TABLE II-6

survey respondents by type of work indicates that about 74 percent of the respondents were employed in trainee, clerical and sales, or service occupations. The hourly wage rates paid to the respondents also reflect the temporary nature of the passengers indicating wages of less than \$2.00 per hour.

A number of other job-related questions were asked of special groupings among the respondents. The intent of these questions is to obtain evidence as to the degree to which the TEMPO bus service was of necessity to the passengers. The response data to these questions are not reported here because of the small size and seasonal nature of the sample. These data will be analyzed in the aggregate and compared with data collected from subsequent on-bus surveys when sufficient data are available for more confident generalization.

An important consideration in the planning of bus routes is the amount of time and effort passengers are willing to invest in riding the bus. Tables II-7 and II-8 give some indication of the conditions under which TEMPO respondents were willing to use the TEMPO bus services. According to the data in Table II-7, the typical TEMPO passenger spent less than five minutes in getting to and from the bus in executing his journey. There is evidence

that some individuals spent more than 25 minutes in getting to or from the bus. A visual examination of the raw data indicated that practically all such respondents transferred from or to another bus in making the journey. Table 8 shows that the majority of the respondents walked both to and from the TEMPO bus. A substantial minority were transfer passengers; however, this apparent willingness to transfer augurs well for the success of additional bus services consciously designed to be integrated with existing bus service networks. Further tests of this important proposition will be made in future on-bus surveys. The MTDP staff are at present working on a program to combine the data on each individual on total time spent between the origin of his journey and its destination. This program is also designed to give estimates on the distance that each passenger traveled on the TEMPO bus line.

The summer, 1968 on-bus survey was the first in a planned series of follow-up studies intended to form the basis of an overall evaluation of the bus services provided by the MTDP experiment. The results of this first on-bus survey were heavily influenced by summer employment programs for young people at McDonnell-Douglas Corporation. The results of the survey suggest that the TEMPO buses were important in helping these workers solve their

**TIME SPENT BY TEMPO PASSENGERS IN GETTING TO
AND FROM TEMPO BUS - SUMMER 1968**

TIME	Origin to Bus		Bus to Destination	
	Number	Percent	Number	Percent
5 minutes or less	83	61.9	72	53.7
6 - 9 minutes	8	6.0	5	3.7
10-14 minutes	16	11.9	17	12.7
15-19 minutes	11	8.2	14	10.4
20-24 minutes	10	7.5	4	3.0
25 minutes or more	<u>6</u>	<u>4.5</u>	<u>22</u>	<u>16.4</u>
TOTAL	134	100.0	134	100.0

TABLE II-7

**METHODS USED BY TEMPO PASSENGERS IN GETTING
TO AND FROM TEMPO BUS - SUMMER 1968**

METHOD	Origin to Bus		Bus to Destination	
	Number	Percent	Number	Percent
Walk	110	82.1	94	70.0
Another Bus	17	12.7	40	29.9
Car	6	4.5	-	-
Other	<u>1</u>	<u>.7</u>	<u>-</u>	<u>-</u>
TOTAL	134	100.0	134	100.0

TABLE II-8

immediate work transportation problems. Future on-bus surveys will provide additional corroborative evidence as to the extent to which the experiment is achieving its primary mission of providing an effective link between city dwellers and county employment opportunities.

TECHNICAL APPENDIX III

The Fenton Route Recommendation

January 6, 1969

Mrs. Margaret Bush Wilson
Acting Director
Model City Agency
Civil Courts Building
12th and Market Streets
St. Louis, Missouri 63101

Dear Mrs. Wilson:

We are at this time submitting to your Agency an integrated system of two transportation corridors designed to link the central City of St. Louis and the Meramec Valley Industrial Complex.

1. The Destination Zone

The above-mentioned industrial areas, near Fenton, Missouri, hold high potential as a destination zone for the second TEMPO experimental line. This potential was brought into a sharp focus during 1967 when Work Opportunities Unlimited, an HDC delegate agency, obtained a job order for 300 relatively unskilled jobs at Chrysler Corporation. Local placement agencies were unable to take full advantage of this opportunity, and a later study indicated that transportation problems were a significant factor in this situation. The MTDP staff have recently concentrated their efforts on an intensive study of this region: Their information is summarized in the following paragraphs.

The Meramec Valley Industrial District (Exhibit 1) includes three industrial parks:

- 1) Fencom Park
- 2) Meramec Industrial Park
- 3) Tree Court Industrial Park

Fencom Park was established in 1966 and is the newest of the three industrial parks in the Fenton area; as such, it is comparatively small and undeveloped. Meramec Industrial Park was established first, in 1958, and includes the largest concentration of manufacturing employment. Both the Chrysler auto assembly and truck assembly plants are located in this park, which also includes Bemis Bag Company and Inland Container Corporation. Maritz, Inc., is located just outside the park. Tree Court Industrial Park was established between Marshall Road and Big Bend Boulevard. Tenant firms of this industrial park

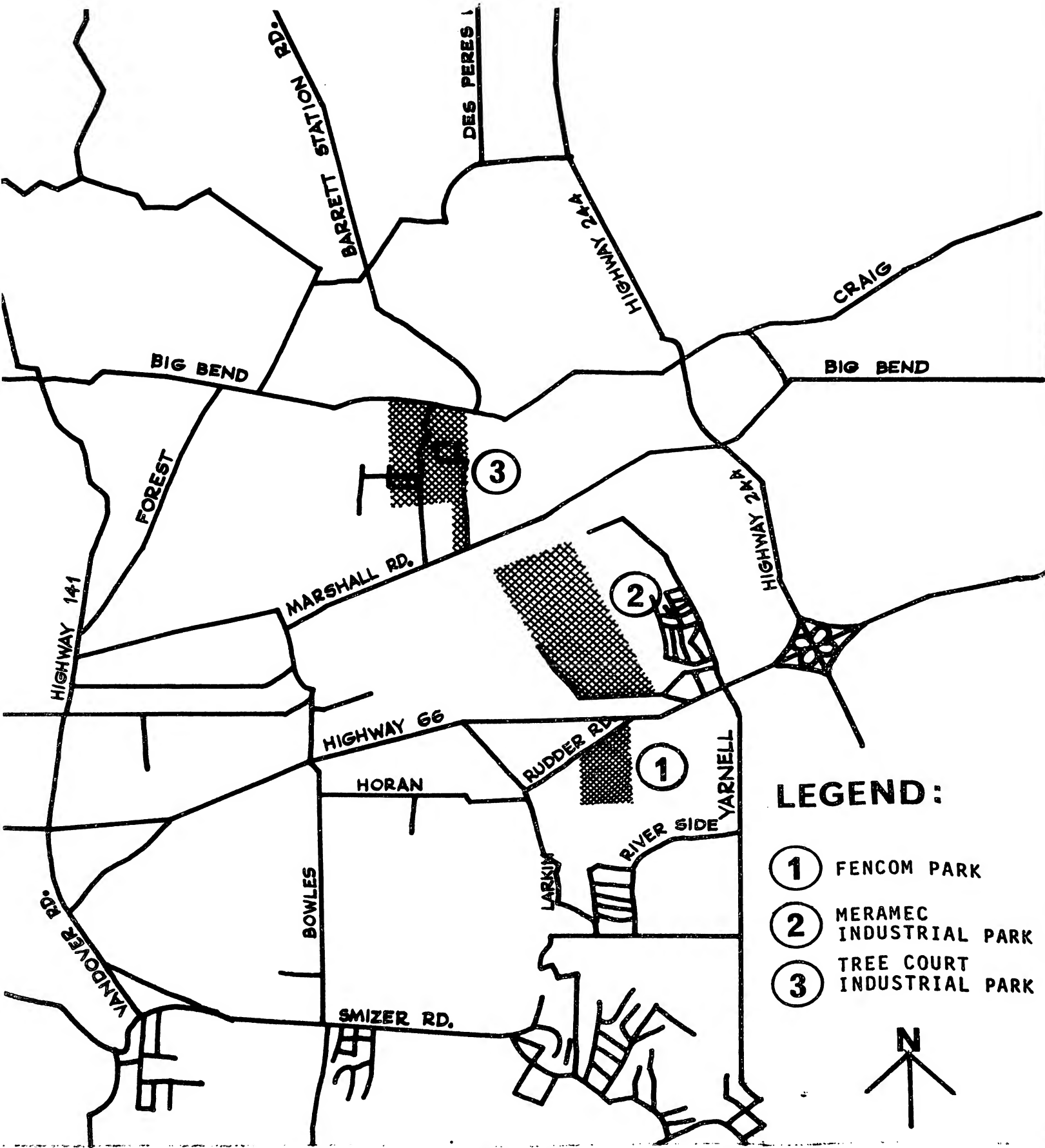


EXHIBIT I

MERAMEC VALLEY INDUSTRIAL DISTRICT

January 6, 1969

include Baldor Electric Company; Bohn and Dawson, Inc.; Keil Engineering Products Company; L. E. Sauer Machine Company; Skillington Box and Lumber Company; and Western Textile Products.

A number of firms are located in the Meramec Valley outside the three industrial parks. These firms include both manufacturing and non-manufacturing operations, such as Archer-Daniels-Midland Company; Interspace Corporation; and Kemco Tool and Machine Company.

Table I contains employment data for selected manufacturing firms in the Meramec Valley Industrial Area. These estimates, based on turnover rates published by the Missouri Division of Employment Security, indicate that the included firms hire approximately 225 new employees per month. There are, of course, non-manufacturing firms (for which such data are not available) in the area, which add to the monthly demand for labor. For example, Maritz, Inc., employs an average of some 600 workers.

The critical importance of the Chrysler Corporation is obvious; they have recently committed themselves to training and employing a minimum of 250 hard-core unemployed at their car and truck plants in this area. The mechanics of their recruiting procedure are particularly relevant to the broad area of coordinating the job development efforts on the TEMPO Project and will be discussed in more detail in the appropriate section of this recommendation.

It is recommended that service to the Meramec Valley Industrial area concentrate on the Meramec Industrial Park, with selected buses also covering the Tree Court Industrial Park complex where feasible.

II. The Transportation Corridors

Many possible transportation corridors leading to the chosen destination zone were investigated by the MTDP staff. Particular effort was directed to examining in depth as many realistic possibilities as the exigencies of available time and data permitted; accordingly, no less than eight possible routes were examined (Exhibits 2-9) and subjected to comparison on various criteria. These eight routes were selected for examination after conferences with other agencies and groups associated with the Project. The following criteria were used. (Table II and Table III)

1. Accessibility to residents of the Model City target area.

TABLE I

<u>NAME OF FIRM</u>	<u>SIZE IN NO. OF EMPLOYEES</u>	<u>NEW HIRES* PER 100 (PER MO.)</u>	<u>NEW HIRES PER MANU- FACTURER (PER MO.)</u>
1. AGCO Cabinet Shop Inc.	10.0	6.3	.63
2. Baldor Electric Company	199.5	2.8	5.59
3. Ballwin Products Corp.	10.0	3.6	.36
4. Bemis Bag Company	399.5	3.7	14.78
5. Bohn & Dawson Inc.	199.5	1.6	3.19
6. Chrysler Corporation (car)	4500.0	2.6	117.0
7. Chrysler Corporation (truck)	1999.5	2.6	51.99
8. Color Art Printing & Stationary Co., Inc.	74.5	2.1	1.56
9. Custom Roto Inc.	10.0	2.1	.21
10. Darco Inc.	10.0	3.6	.36
11. Duvall Screw Products	10.0	3.6	.36
12. Elbredor, Chas. & Co. Inc.	10.0	1.7	.17
13. Fenton Food Mill & Molding	10.0	1.8	.18
14. Fenton Supply Co. Inc.	10.0	2.2	.22
15. Holzor Sand & Gravel Co.	12.5	2.2	.28
16. Horn, G. C. Welding Co.	10.0	3.6	.36
17. Inland Container Corp.	74.5	4.9	3.65
18. Keil Engr. Products	34.5	2.9	1.00

* Monthly Report on Labor Turnover, Missouri Division of Employment Security
(Annual average, 1967)

ESTIMATED ANNUAL MONTHLY AVERAGE NEW HIRES
FOR SELECTED MANUFACTURING FIRMS
IN THE MERAMEC VALLEY INDUSTRIAL COMPLEX

TABLE I (Cont'd.)

NAME OF FIRM	SIZE IN NO. OF EMPLOYEES	NEW HIRES PER 100 (PER MO.)	NEW HIRES PER MANU- FACTURER (PER MO.)
19. Kemco Tool & Machine Co.	74.5	2.6	1.94
20. Koller Kraft Plastic Products Inc.	149.5	4.8	7.18
21. Rollo Sheets Inc.	34.5	4.8	1.66
22. Saur, L. E. Machine Co.	49.5	2.8	1.39
23. Shillington Box Co.	34.5	4.9	1.69
24. St. Louis & Jefferson County News	12.5	2.1	.26
25. Western Textile Products	199.5	4.8	9.58
26. Zimmerer, Fred C. & Sons Pattern Co.	10.0	2.8	.28
	8148.5	Monthly Total	- 225.87
		Yearly Total	- 2710.44

Description of Evaluation Criterion	Route Number							
	1	2	3	4	5	6	7	8
<u>Accessibility to:</u>								
1. Model City Area Residents	No	No	Yes	Yes	Yes	Yes	No	Yes
Rank*	7	7	1.5	3.5	1.5	5	7	3.5
2. City Poverty Area Residents	17,566	4,056	70,848	40,390	79,559	53,358	28,153	42,362
Rank*	7	8	2	5	1	3	6	4
3. Other Poverty Area Residents	No	Yes	No	No	No	Yes	Yes	Yes
4. All Residents of City	54,468	13,692	108,723	42,953	118,686	96,999	33,064	45,333
Rank*	4	8	2	6	1	3	7	5
5. Other County Industrial Areas	No	Yes	No	No	No	No	Yes	Yes
6. Number of Poverty Areas Served	1	1	7	6	7	6	4	6
Rank*	7.5	7.5	1.5	4	1.5	4	6	4
7. Total Travel Time	48.5	60.0	68.5	52.0	78.5	91.0	70.5	77.0
Rank*	1	3	4	2	7	8	5	6
8. Total Route Mileage	16.5	19.2	21.3	25.6	24.9	27.0	23.0	25.1
Rank*	1	2	3	7	5	8	4	6

* Rank refers to the comparison between the different routes on any single criterion ranging from 1 (most desirable) to 8 (least desirable)

TABLE II

Comparison Table - Routes from City of Saint Louis to Fenton Area

Description of Area	Estimated Accessible Population of Route							
	1	2	3	4	5	6	7	8
<u>Poverty Areas:</u>								
Yeatman	0	0	18,957	3,811	12,086	10,227	0	4,209
Carr-Central	0	0	7,565	8,305	8,305	3,434	0	7,565
Montgomery-Hyde Park	0	0	2,081	1,810	8,826	0	0	2,081
Murphy-Blair	0	0	0	0	0	0	0	0
Pruitt-Igoe	0	0	13,614	13,614	13,614	1,438	0	13,614
Chouteau-Russell	17,566	0	17,605	10,834	17,865	17,408	0	12,877
Easton-Taylor	0	0	6,176	0	14,984	0	0	0
Union-Sarah	0	0	4,850	0	0	16,737	6,870	0
Midtown	0	0	0	2,016	0	0	3,630	2,016
Wells-Goodfellow	0	0	0	0	3,879	0	4,283	0
West End	0	4,056	0	0	0	4,601	13,370	0
TOTAL POVERTY AREAS	17,566	4,056	70,848	40,390	79,559	53,358	28,153	42,362
TOTAL CITY	54,468	13,692	108,723	42,953	118,686	96,999	33,064	45,333

TABLE III

City of Saint Louis Population with Potential Access to
Alternative Routes to Fenton by Area -
Based on 1965 Population Estimates

FENTON ROUTE No.1 (proposed)

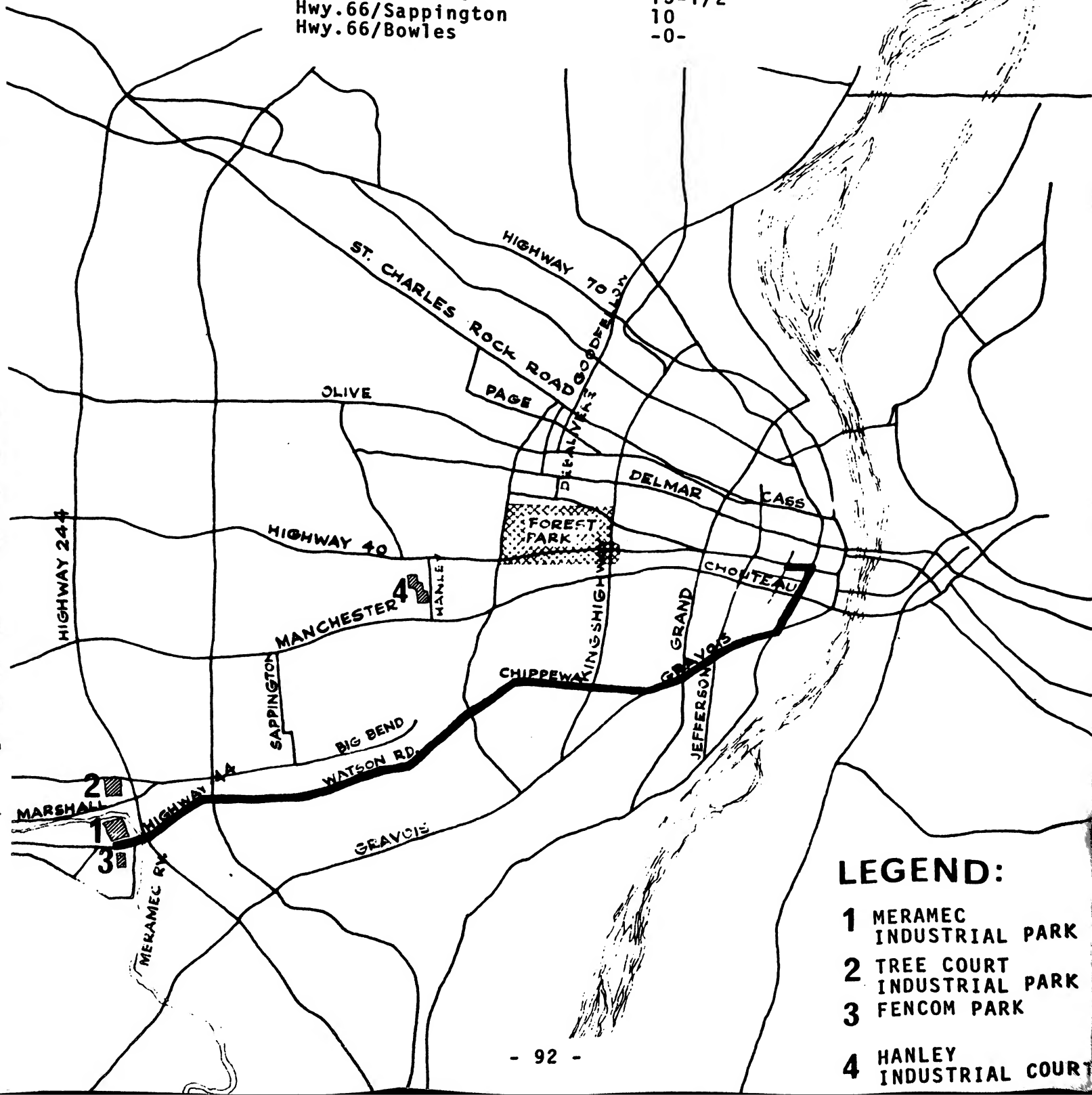
RUNNING TIME (EST.)

Minutes to
end of Route

FROM:

14th/Park
Gravois/Jefferson
Gravois/Grand
Chippewa/Kingshighway
Chippewa/Hampton
Watson/Laclede
Hwy.66/Sappington
Hwy.66/Bowles

48-1/2
42-1/2
36-1/2
29-1/2
25
15-1/2
10
-0-



LEGEND:

- 1 MERAMEC INDUSTRIAL PARK
- 2 TREE COURT INDUSTRIAL PARK
- 3 FENCOM PARK
- 4 HANLEY INDUSTRIAL COURT

FENTON ROUTE No.2 (proposed)

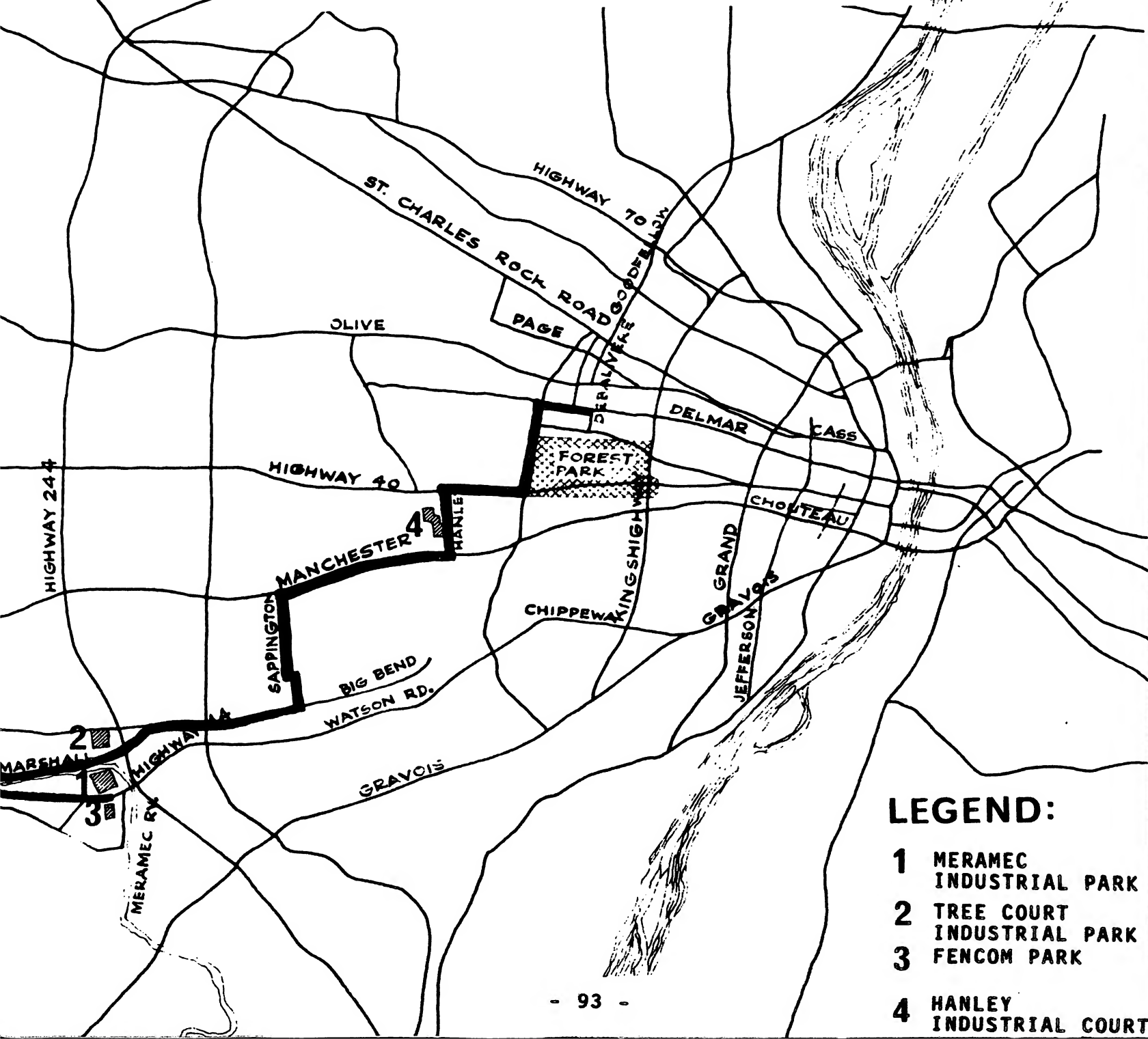
RUNNING TIME (EST.)

FROM:

Delmar/DeBaliviere
 Skinker/Clayton Rd.
 Hwy.40/Hanley
 Manchester/Brentwood
 Sappington/Lockwood
 BigBend/Lindbergh
 St.Louis/10th(Val.Pk.)
 Hwy.66/Bowles

Minutes to
 end of Route

60
 51
 47
 40
 28-1/2
 21
 10
 -0-



LEGEND:

- 1 MERAMEC INDUSTRIAL PARK
- 2 TREE COURT INDUSTRIAL PARK
- 3 FENCOM PARK
- 4 HANLEY INDUSTRIAL COURT

FENTON ROUTE No.3 (proposed)

RUNNING TIME (EST.)

Minutes to end
of Route

FROM:

Easton/Taylor

68-1/2

Jefferson/Cass

58-1/2

Carr/20th

55-1/2

12th/Chouteau

48-1/2

Gravois/Jefferson

42-1/2

Gravois/Grand

36-1/2

Chippewa/Kingshighway

29-1/2

Chippewa/Hampton

25

Watson/Laclede

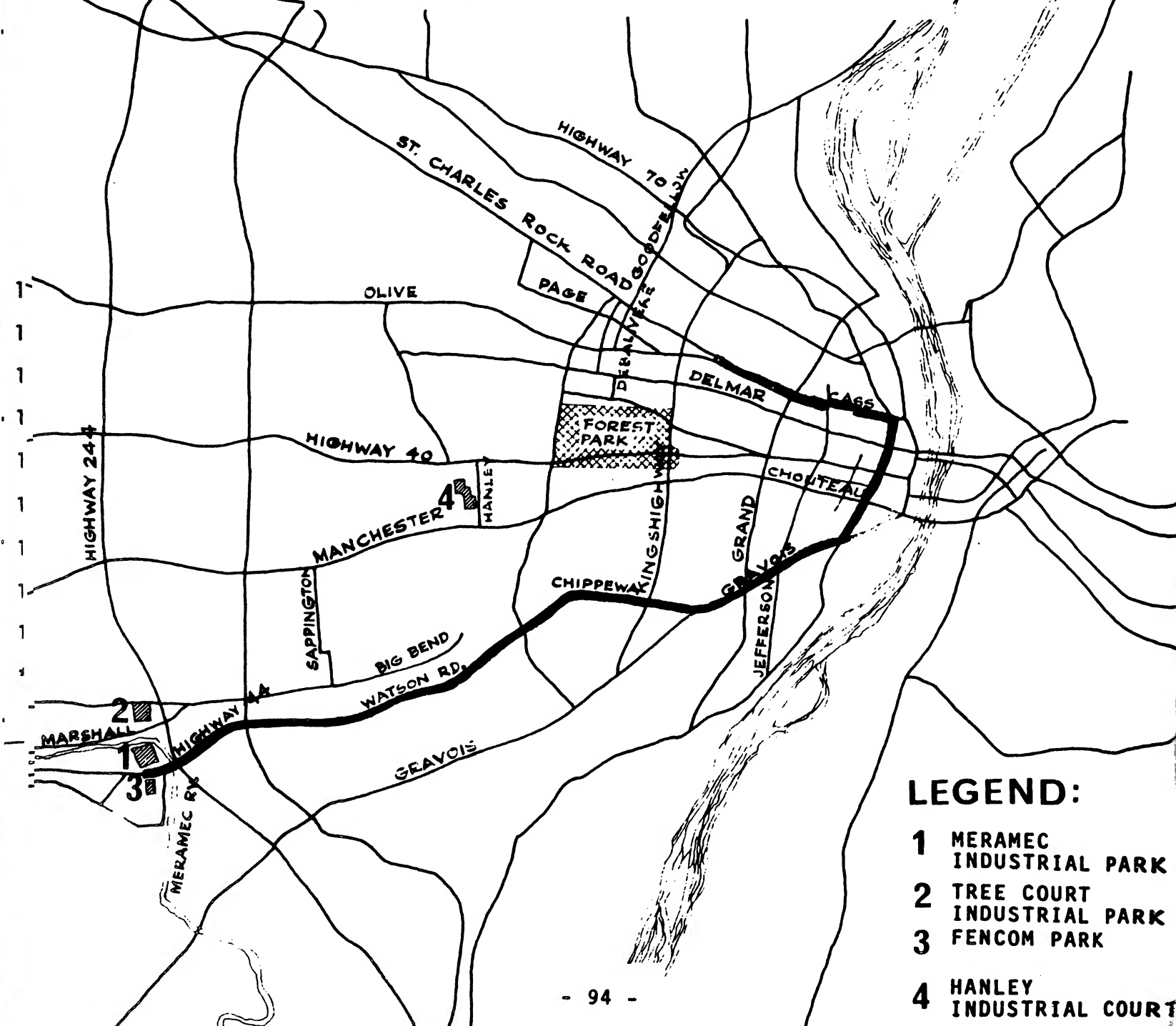
15-1/2

Hwy.66/Sappington

10

Hwy.66/Bowles

0



LEGEND:

- 1 MERAMEC INDUSTRIAL PARK
- 2 TREE COURT INDUSTRIAL PARK
- 3 FENCOM PARK
- 4 HANLEY INDUSTRIAL COURT

FENTON ROUTE No.4 (proposed)

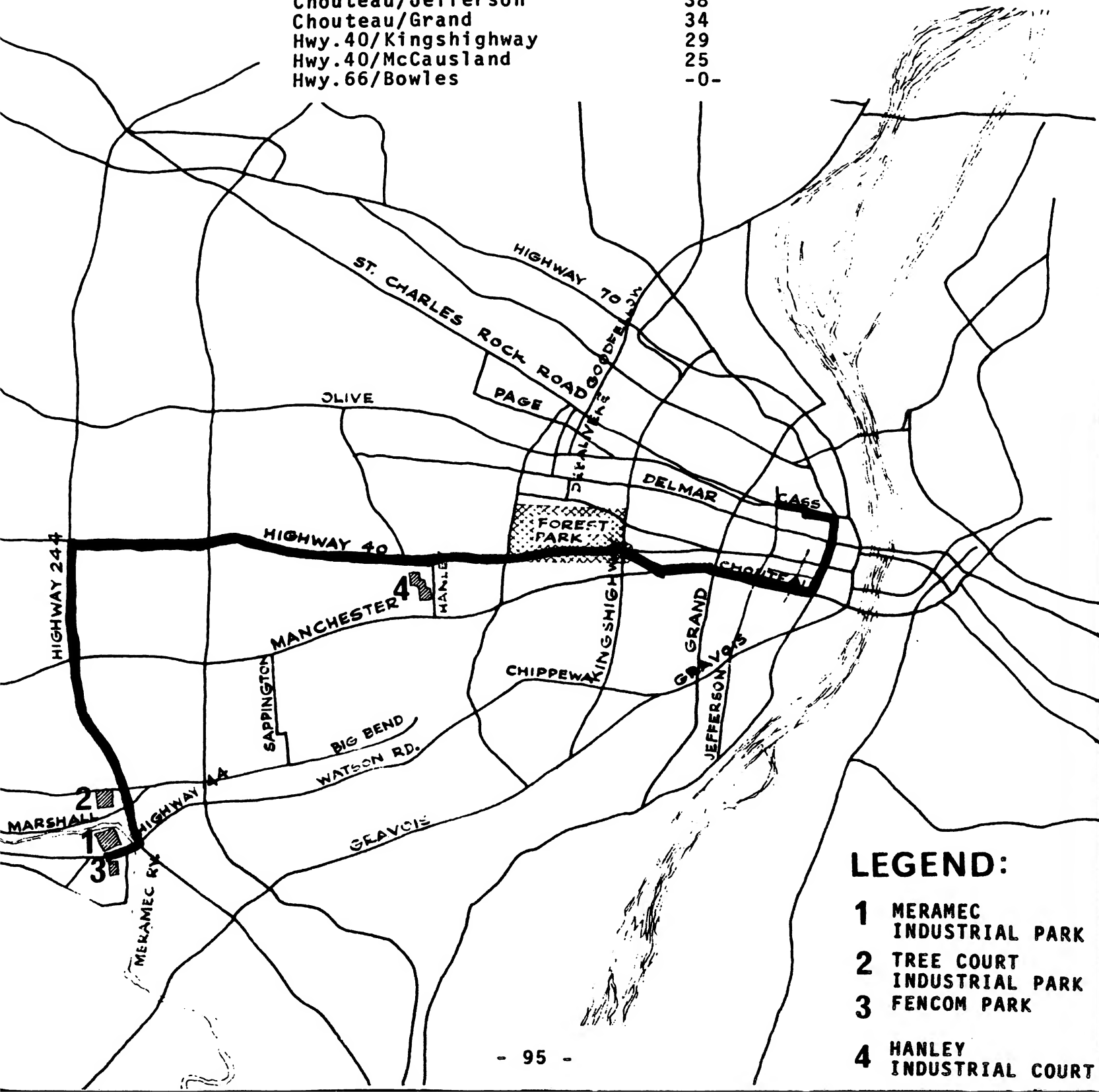
RUNNING TIME (EST.)

Minutes to end
of Route

FROM:

Jefferson/Cass
Carr/20th
12th/Chouteau
Chouteau/Jefferson
Chouteau/Grand
Hwy. 40/Kingshighway
Hwy. 40/McCausland
Hwy. 66/Bowles

52
49
42
38
34
29
25
-0-



LEGEND:

- 1 MERAMEC INDUSTRIAL PARK
- 2 TREE COURT INDUSTRIAL PARK
- 3 FENCOM PARK
- 4 HANLEY INDUSTRIAL COURT

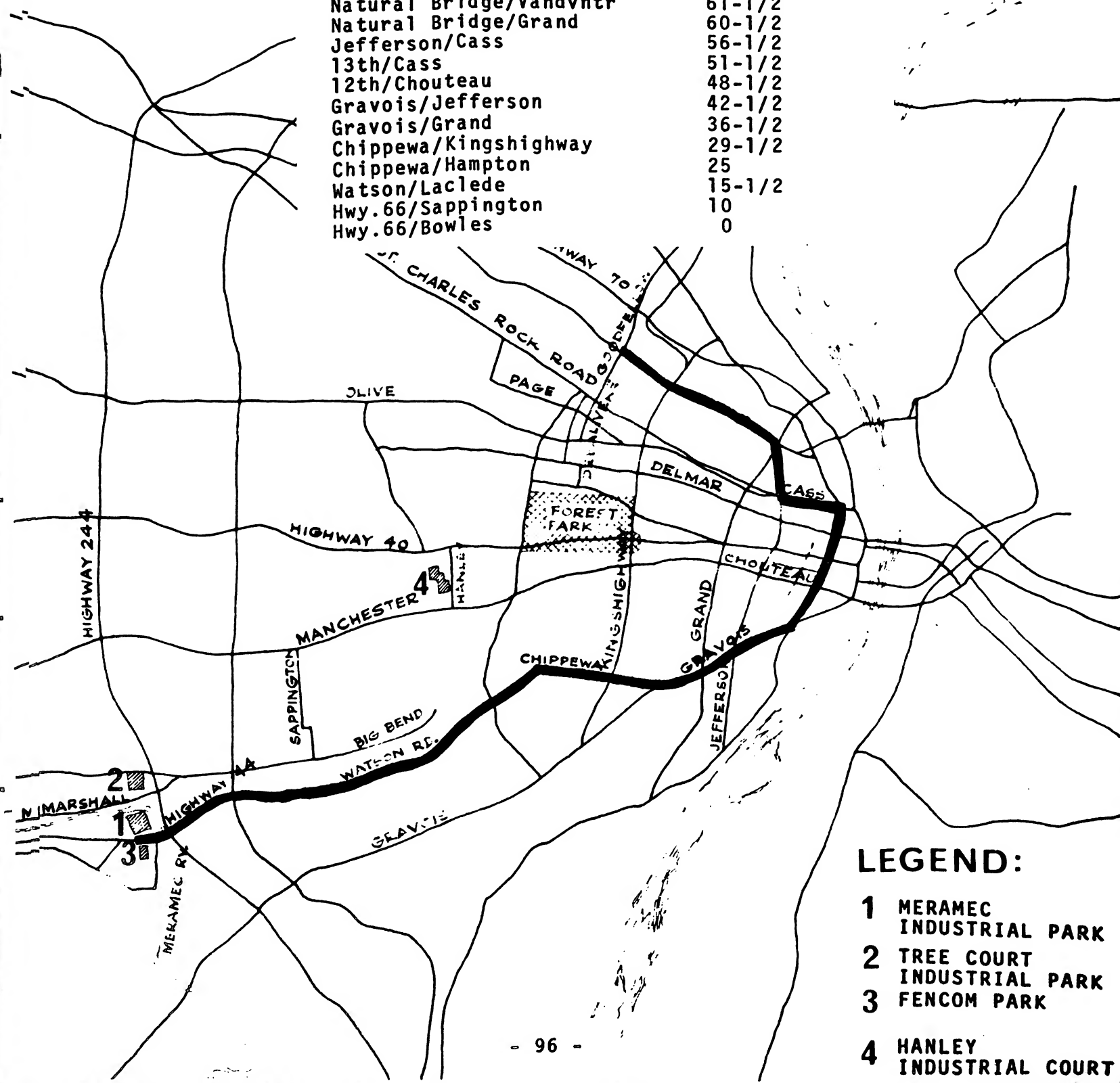
FENTON ROUTE No.5 (proposed)

RUNNING TIME (EST.)

Minutes to End
of Route

FROM:

Natural Bridge/Goodfellow	71-1/2
Natural Bridge/Union	68-1/2
Natural Bridge/Kingshwy	67-1/2
Natural Bridge/Newstead	64-1/2
Natural Bridge/Fair	62-1/2
Natural Bridge/Vandvnr	61-1/2
Natural Bridge/Grand	60-1/2
Jefferson/Cass	56-1/2
13th/Cass	51-1/2
12th/Chouteau	48-1/2
Gravois/Jefferson	42-1/2
Gravois/Grand	36-1/2
Chippewa/Kingshighway	29-1/2
Chippewa/Hampton	25
Watson/Laclede	15-1/2
Hwy. 66/Sappington	10
Hwy. 66/Bowles	0



LEGEND:

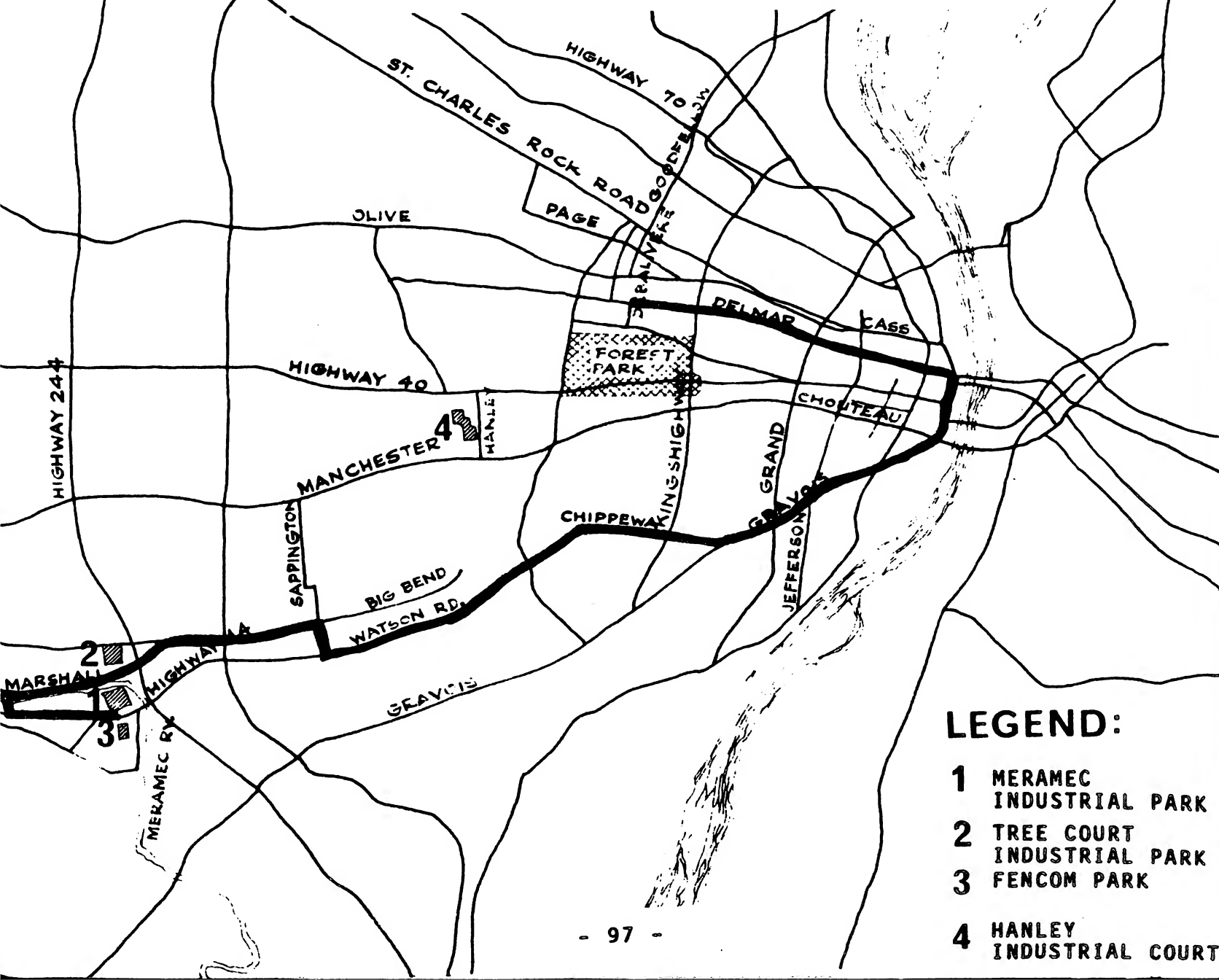
- 1 MERAMEC INDUSTRIAL PARK
- 2 TREE COURT INDUSTRIAL PARK
- 3 FENCOM PARK
- 4 HANLEY INDUSTRIAL COURT

FENTON ROUTE No.6 (proposed)

RUNNING TIME (EST.)
FROM:

Minutes to End
of Route

Delmar/DeBaliviere	91
Delmar/Kingshighway	86-1/2
Delmar/Taylor	84-1/2
Delmar/Grand	79
Delmar/Jefferson	75
12th/Chouteau	67
Gravois/Jefferson	61
Gravois/Grand	55
Chippewa/Kingshighway	49
Chippewa/Hampton	44-1/2
Watson/Laclede	34-1/2
Hwy.66/Sappington	29
Big Bend/Lindbergh	21-1/2
St.Louis/10th(Val.Pk.)	10
Hwy.66/Bowles	0



LEGEND:

- 1 MERAMEC INDUSTRIAL PARK
- 2 TREE COURT INDUSTRIAL PARK
- 3 FENCOM PARK
- 4 HANLEY INDUSTRIAL COURT

FENTON ROUTE No.7 (proposed)

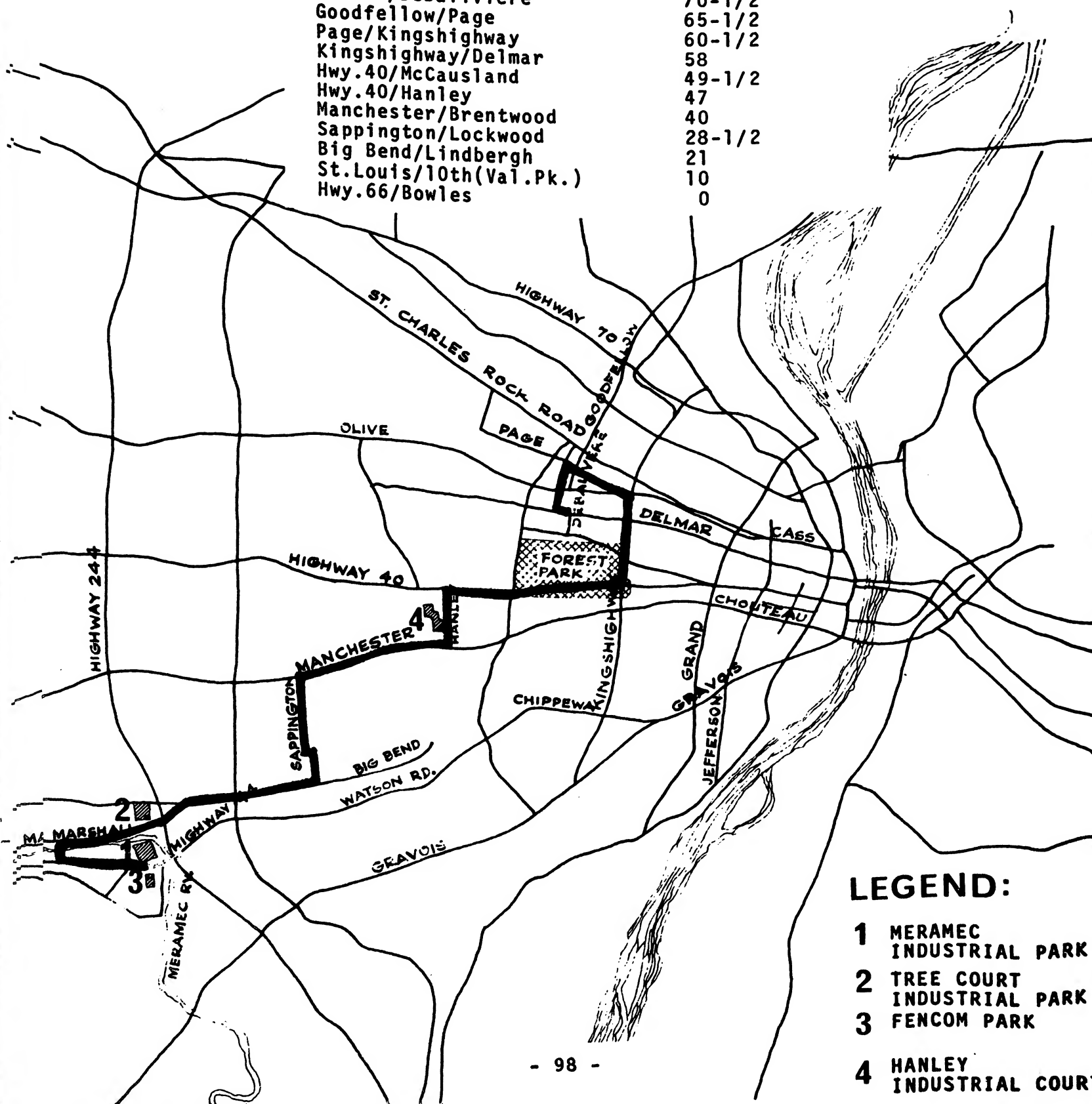
RUNNING TIME (EST.)

Minutes to End
of Route

FROM:

Delmar/DeBaliviere
Goodfellow/Page
Page/Kingshighway
Kingshighway/Delmar
Hwy.40/McCausland
Hwy.40/Hanley
Manchester/Brentwood
Sappington/Lockwood
Big Bend/Lindbergh
St.Louis/10th(Val.Pk.)
Hwy.66/Bowles

70-1/2
65-1/2
60-1/2
58
49-1/2
47
40
28-1/2
21
10
0



LEGEND:

- 1 MERAMEC INDUSTRIAL PARK
- 2 TREE COURT INDUSTRIAL PARK
- 3 FENCOM PARK
- 4 HANLEY INDUSTRIAL COURT

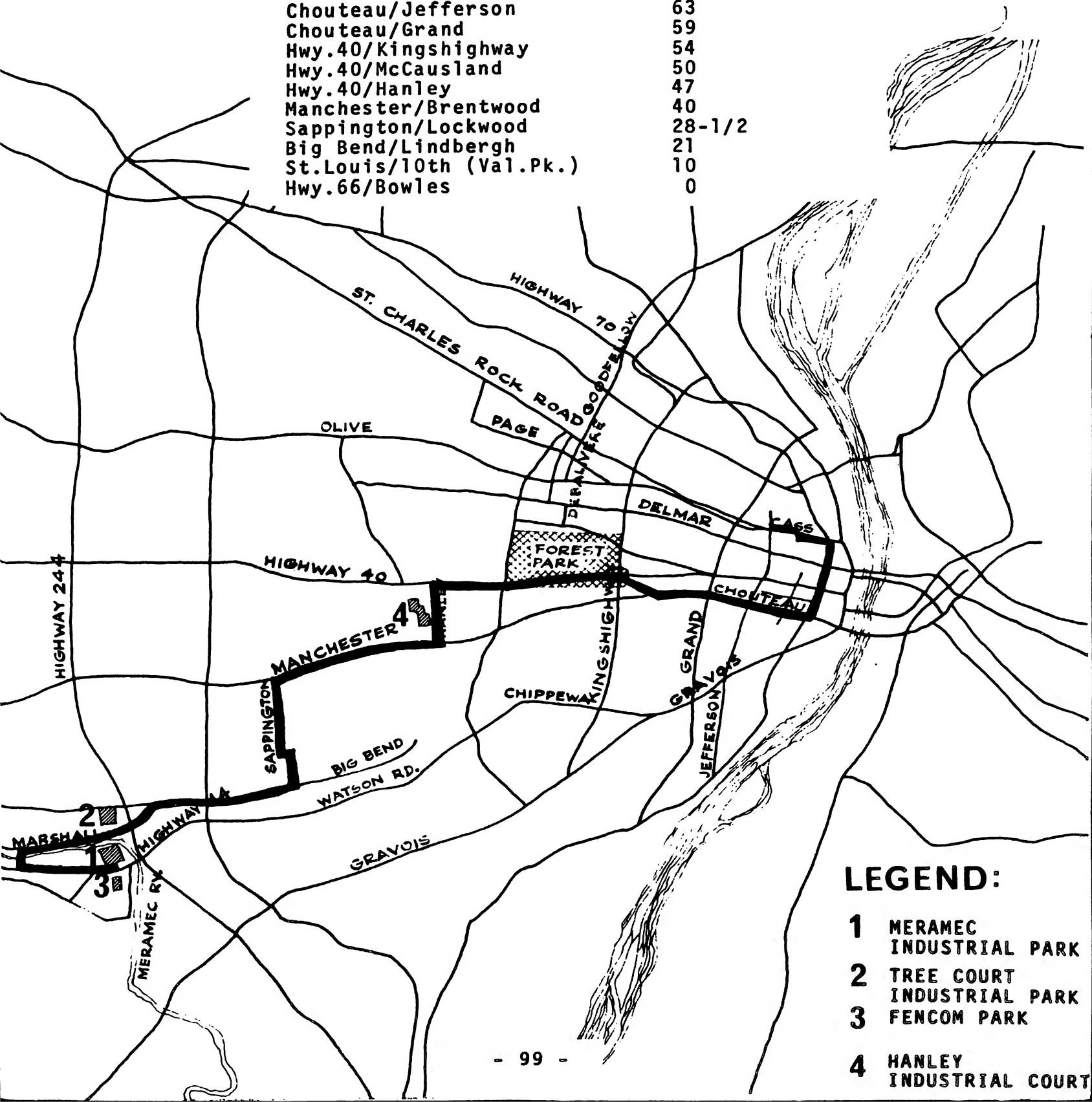
FENTON ROUTE No.8 (proposed)

RUNNING TIME (EST.)

Minutes to End
of Route

FROM:

Jefferson/Cass	77
Carr/20th	74
12th/Chouteau	67
Chouteau/Jefferson	63
Chouteau/Grand	59
Hwy.40/Kingshighway	54
Hwy.40/McCausland	50
Hwy.40/Hanley	47
Manchester/Brentwood	40
Sappington/Lockwood	28-1/2
Big Bend/Lindbergh	21
St.Louis/10th (Val.Pk.)	10
Hwy.66/Bowles	0



LEGEND:

- 1 MERAMEC INDUSTRIAL PARK
- 2 TREE COURT INDUSTRIAL PARK
- 3 FENCOM PARK
- 4 HANLEY INDUSTRIAL COURT

January 6, 1969

2. Accessibility to residents of poverty areas within the City of St. Louis
3. Accessibility to residents of poverty areas outside the city limits but contiguous to the destination zone. (e.g., Meacham Park and Valley Park)
4. Accessibility to residents of the City of St. Louis
5. Accessibility to other possible industrial complexes. (e.g., Hanley Industrial Court)
6. Number of poverty areas served
7. Travel time
8. Distance (route mileage)

A given corridor was deemed "accessible" to those residents within approximately one-quarter mile of such corridor, in accord with the most recent data concerning ridership habits in the St. Louis area. Population estimates were carefully prepared using the Mass Transportation Master File under development by the planning staff, in conjunction with aggregation systems designed especially for this Project. (Table III represents the output of one such system.) Data from the 1960 census were updated to 1965 during the course of building these systems and will be available for further contemplated planning efforts. Travel time and route mileage estimates (which are directly related to cost) were provided upon request by Bi-State Transit Services.

The following conclusions were reached:

ROUTE 1: Reject from further consideration. It will be noted from the data in Table II that Route 1: 1) does not serve any Model City areas; 2) serves only one poverty area; 3) ranks seventh in number of poverty area residents potentially served; 4) does not provide service to contiguous county poverty areas. The fact that Route 1 has the lowest estimated travel time and travel distance of the eight alternatives cannot outweigh the above comparative disadvantages.

ROUTE 2: Reject from further consideration. Route 2 compares very badly on service criteria; it rates lowest in potential service to poverty area and city population; serves only one poverty area in the

city and does not provide service to any Model City areas. The comparative advantages in terms of travel time, travel distance and service to contiguous county poverty areas do not compensate for these relative deficiencies.

ROUTE 3: Retain for further consideration. Route 3 ranks high on accessibility to city and county poverty area residents and Model City and other city poverty areas. In fact, it ranks first with Route 5 in this respect. Route 5 ranks low on travel time and distance relative to Route 3 and shares its drawback of not serving contiguous county poverty areas.

ROUTE 4: Reject from further consideration. Route 4 is evaluated as mediocre in terms of accessibility to potential passengers and poor on distance and, therefore, cost. The only criterion on which it ranks high is travel time, which is not sufficient to overcome the comparative disadvantages of this route.

ROUTE 5: Reject in favor of Route 3. See the comparative comments under Route 3 above. Route 5 is really an extension of Route 3 and adds little in service potential for fairly large increments in travel time and cost.

ROUTE 6: Reject from further consideration. Route 6 ranks lowest of all alternatives in its desirability in terms of travel time and distance. In fact, the total travel time of 91 minutes is prohibitively long. The additional costs in terms of travel time and distance outweigh the incremental benefits in accessibility to potential passengers.

ROUTE 7: Retain for further consideration. Route 7 was designed to provide integrated service with Route 3. It must be evaluated in this context. The joint evaluation of Routes 3 and 7 are reserved until later.

ROUTE 8: Retain as a competitive alternative in a more detailed weighting against the combination of Routes 3 and 7. Route 8 is a compromise choice retaining service to contiguous county poverty areas, while serving major portions of the population groups potentially served by Route 3.

At this juncture, a systematic comparison was made between

- 1) a combination of Routes 3 and 7, and
- 2) Route 8

Routes 3 and 7 in combination offer good direct service to the Model City area (including the W. O. Pruitt Homes, William L. Igoo Apartments, George L. Vaughn Apartments, William Dee Becker Apartments, and Carr Square Village.) This duo also provides direct service to

January 6, 1969

residents in ten of the eleven poverty areas in the City of St. Louis (and connecting service to residents in the eleventh.) Accessibility is provided, in fact, for a substantial proportion of inner city poverty area residents - about 100,000, according to the 1965 population estimates. Route 8 offers similar service to approximately 42,000 such persons.

Route 8 is approximately twenty-five miles long, while Routes 3 and 7 in combination total about forty-four miles. Thus, a 76 percent increment in distance (and therefore cost to the Project) necessitated by the combined route is offset by a 138 percent increase in poverty area population served. This fact, in addition to the increased travel time on Route 8, led to the decision summarized below.

It is recommended that bus services be provided following the two routes outlined as follows:

ROUTE A: Starts from the corner of Taylor and Easton Avenues; east on Easton to Cass; east on Cass to Jefferson Avenue; south on Jefferson to Carr; east on Carr to Cole; east on Cole to 12th Boulevard; south on 12th to Gravois; west on Gravois to Chippewa; west on Chippewa to Watson Road; west on Watson Road to the Destination Zone.

ROUTE B: Starts from the DeBaliviere Loop and Delmar Boulevard; west on Delmar to Goodfellow Boulevard; north on Goodfellow to Page Boulevard; east on Page to Kingshighway; south on Kingshighway to Highway 40; west on Highway 40 to Hanley Road; south on Hanley to Manchester Road; west on Manchester to Sappington Road; south on Sappington Road to Big Bend Boulevard; west on Big Bend to Meacham Park; west on Big Bend to Marshall Road; west on Marshall Road to the Destination Zone.

It is further recommended that such service begin with two buses on each line serving the day shift and one bus on each line to serve the night shift. Additional service can then be instituted when and if it is necessary. Experience with the TEMPO Northwest line strongly indicates that starting with limited service and expanding when conditions warrant such action is preferable to the immediate implementation of extensive service. The MTDP staff will be available to assist in determining precise scheduling and routing within the Destination zone; preliminary conferences and field inspections with both Chrysler Corporation executives and Bi-State personnel have already taken place. It should be noted that these determinations will, of necessity, involve compromise and trade-offs. One particular problem is the fact that Chrysler periodically (but not regularly) changes shifts. Some agreement will have to be effected with Bi-State which will increase their flexibility of response to such needs, inasmuch as their presently stated capacity for response will not be sufficient for this

January 6, 1969

undertaking. A "club bus" arrangement, tied directly to Chrysler, may well be the most practical means of initiating service along these corridors.

The cost of operating the proposed corridor cannot be pinpointed at this time because it depends to a great extent on the efficiency with which Bi-State can incorporate the service into their present system. A totally incorporated line would cost approximately \$260/day or \$1,300/week for the service described above; however, the actual cost would, in all probability, be closer to the \$520/day or \$2,600/week necessary for an unincorporated line. This figure could be expected to become lower with time, inasmuch as Bi-State could integrate the service incrementally. The per passenger revenue necessary for the Project to "break even" would then vary from a minimum of \$0.43 to a maximum of \$0.86 based on a 100 percent load factor (see Table IV.)

There are other points which should be given careful consideration, concomitant to action upon the corridor recommendation. First, the question of distribution of fare revenue between the Project and Bi-State should be carefully reviewed in light of Bi-State's decision to discontinue the sale of passes on buses. This decision, along with data gathered by the MTDP staff on a considerable sample of TEMPO riders, leads to the conclusion that the Project should be credited with approximately \$0.25 per pass rider rather than the present \$0.15. The detailed data which form the basis for this recommendation will be provided at your request. Second, an increased effort in the area of job development and placement along the TEMPO destination zones is necessary if this Project is to succeed. The Human Development Corporation will continue to cooperate in such efforts, but our resources are clearly not sufficient to meet all the needs of the Project in this area. For example, Chrysler Corporation will be doing all recruiting for their training program through the Missouri Division of Employment Security.

In view of the critical importance of this effort, we feel that it would be both appropriate and desirable for the Model City Agency to motivate and coordinate the area-wide resources in this field. Obtaining the active cooperation of the Missouri State Employment Service, along with the cooperation of other groups such as the Urban League, should be given priority in any such effort. The Human Development Corporation will, of course, assist you in any way we are able in this important task. Perhaps the considerable skills available to your Agency in the persons of the Sub-City Planners could also be utilized for this purpose in line with your recently stated aim to reorient their duties.

	Incorporated Service			Unincorporated Service		
	Route A	Route B	Combined	Route A	Route B	Combined
<i>Load Factor</i>						
100%	.40	.46	.43	.80	.92	.86
90%	.46	.50	.48	.90	1.02	.96
80%	.50	.58	.54	1.02	1.14	1.08
70%	.58	.64	.61	1.14	1.30	1.22
60%	.68	.76	.72	1.34	1.52	1.43
50%	.80	.92	.86	1.62	1.82	1.72
40%	1.02	1.14	1.08	2.02	2.28	2.15
30%	1.34	1.52	1.43	2.68	3.04	2.86
20%	2.02	2.28	2.15	4.04	4.56	4.30
10%	4.04	4.56	4.30	8.08	9.12	8.60

(\$/Passenger)

TABLE IV
Break-Even Point in Revenue/Passenger

January 6, 1969

The cooperation which you and your staff have extended during the past few months has been sincerely appreciated. If there is anything further we can do to help expedite the implementation of these recommendations, please do not hesitate to ask.

Sincerely,

Robert J. Baer, Chief,
Planning, Analysis and Support Services

RJB:mlr

cc: Clyde S. Cahill, Jr., General Manager
Harold Antoine, Chief, Operations
Curtis Gatlin, Chief, Work Programs
Joseph Hupert, Coordinator, Mass Transportation

TECHNICAL APPENDIX IV

Memorandum Recommending Reduction in Service on TEMPO/Northwest Line

Mass Transportation Demonstration Project

MEMORANDUM

TO: Joseph S. Hupert, Coordinator

DATE: 9/26/68

FROM: Coenraad L. Mohr, Consultant

cc: Robert Baer and Myron Pollack

SUBJECT: Analysis of Ridership Costs and Revenues of TEMPO Buses -
August 5 - September 1, 1968

The four-week period August 5 through September 1, 1968 was selected to analyze the performance of the TEMPO buses for two primary reasons: 1) there were no changes in the number of buses, routing, or scheduling of any buses during this period, and 2) these four weeks represent the most recent period for which complete data on ridership, costs and revenue were available from the Bi-State Development Agency.

During the four-week period sixteen outbound and fifteen inbound buses carried a total of 4,607 one-way riders at a total cost to the MTDP Project of \$18,160.84 or at an average cost of \$3.94 per rider. The number of riders carried by each bus during this period varied from none in the case of one bus to 1,001 in the case of another. There was considerable bunching of ridership on outbound buses in the early morning hours and on inbound buses during mid-afternoon. The result was that four morning and four afternoon buses carried 82 percent of all riders for the four weeks. It has become obvious that the TEMPO bus service, until that date, had been used primarily by regular day-shift workers.

As a result of this ridership pattern it was decided to discontinue six outbound buses and nine inbound buses in the off-peak periods of the day. On the basis of the statistics for the four-week period these buses carried only about six percent of all TEMPO riders but contributed over 40 percent to the total cost of providing the bus services. (See Table I below.)

9/26/68

Table 1 - Summary of Ridership, Revenue and Cost Statistics for the TEMPO Buses - August 5 through September 1, 1968

CATEGORY	RIDERS		REVENUE		COST		Average Cost Per Rider
	Number	%	Amount	%	Amount	%	
Buses Retained (16)	4,321	93.8	1,051.76	93.7	10,619.44	58.5	2.46
Buses Discontinued (15)	286	6.2	70.97	6.3	7,541.40	41.5	26.38
TOTAL	4,607	100.0	1,122.73	100.0	18,160.84	100.0	3.94

The average cost per rider for the fifteen discontinued buses was \$26.38, in comparison to an average cost of \$2.46 per rider on the remaining buses. Actual savings as a result of the reduction of service on this line will be somewhat lower than the amounts indicated by this analysis. Discontinuation of the low volume, off-peak buses will cause an increase in the dead-head mileage for some of the remaining buses. The savings will nevertheless be substantial for a relatively small anticipated loss in ridership. Table 2 shows a detailed breakdown of the statistics for each of the 31 buses on the original schedule.

The results of the analysis reported here need to be qualified. The revenue estimated for each bus were obtained by multiplying the number of bus riders per bus by the overall average weekly revenue per rider. Bus revenues vary from rider to rider depending on the method of fare payment used by individual riders. The rider counts per bus are actual operator counts and the cost figures are based on the accounting and mileage rates used by the Bi-State Development Agency for billing the MTDP. These figures, unlike the revenue per bus figures are, therefore, very reliable.

9/26/68

The analysis was, of course, based on historical data. Prediction of future ridership and cost per rider figures may vary from historical expectation. For example, the late week of August showed a drop-off in total ridership; a trend that has persisted into the early part of September. This trend coincides with reduction in summer seasonal highs in employment. We can, therefore, expect a decrease in ridership in the immediate future and an increase in cost per rider over the \$2.46 predicted by the analysis summarized in Table 1.

A final qualification of the generalizations implicit in this analysis is related to the fact that we are changing an integrated network of transportation by removing some of its parts. The effects on ridership and costs of the realignment of the network could not be evaluated with the available data.

CLM:mlr

TABLE 2

SUMMARY TABULATION OF RIDERSHIP, REVENUE AND COST RELATIONSHIP
FOR FOUR WEEKS AUGUST 5 - SEPTEMBER 1, 1968
BY INDIVIDUAL BUS LINES

Buses OUTBOUND	Total Riders	Est. Total Revenue \$	Est. Total Cost	RANKING		Cost/ Rider	WEEKLY AVERAGES		
				Riders	Cost/ Rider		Riders	Rev.	Cost
5:10 a.m.	376	90.20	<u>891.44</u>	4	7	2.371	94.0	22.55	222.86
5:23 a.m.	456	110.88	<u>841.32</u>	3	3	1.845	114.0	27.72	210.33
5:41 a.m.	169	41.59	<u>527.44</u>	9	8	3.121	42.3	10.40	131.86
6:35 a.m.	1,001	243.34	<u>596.16</u>	1	2	.596	250.3	60.84	596.16
6:53 a.m.	171	42.82	<u>850.60</u>	8	9	4.974	42.8	10.71	212.65
9:01 a.m.	38	9.28	<u>804.16</u>	18	19	21.162	9.5	2.32	201.04
1:01 p.m.	43	10.62	<u>618.44</u>	16	17	14.382	10.8	2.66	154.61
1:38 p.m.	<u>16</u>	<u>3.91</u>	<u>455.00</u>	22	23	28.438	4.0	.98	113.75
2:17 p.m.	<u>13</u>	<u>3.29</u>	<u>767.04</u>	24	26	59.003	3.3	.82	191.76
2:53 p.m.	42	10.43	<u>545.00</u>	17	16	13.000	10.5	2.61	136.50
3:11 p.m.	47	11.47	<u>570.16</u>	14	15	12.131	11.8	2.87	142.54
3:36 p.m.	62	15.38	<u>603.60</u>	13	12	9.735	15.5	3.85	150.90
9:42 p.m.	<u>9</u>	<u>2.25</u>	<u>555.32</u>	26.5	27	61.70	2.3	.56	138.83
10:48 p.m.	<u>46</u>	<u>11.28</u>	<u>536.72</u>	15	13	11.668	11.5	2.82	134.18
11:49 p.m.	<u>0</u>	<u>0</u>	<u>566.44</u>	31	31		0	0	141.61
un-10:48 p.m.	<u>6</u>	<u>1.60</u>	<u>166.04</u>	29	22	27.673	1.5	.40	41.51

* - Discontinued buses underlined

TABLE 2 - Cont'd.

Buses INBOUND	Total Riders	Est. Total Revenue \$	Est. Total Cost	RANKING		Cost/ Rider	WEEKLY AVERAGES		
				Riders	Cost/ Rider		Riders	Rev.	Cost
*7:00 a.m.	<u>87</u>	<u>21.46</u>	<u>475.44</u>	10	10	5.465	21.8	5.37	118.86
8:07 a.m.	<u>19</u>	<u>4.71</u>	<u>594.32</u>	21	24	31.280	4.8	1.18	148.58
8:34 a.m.	<u>9</u>	<u>2.18</u>	<u>845.04</u>	26.5	30	93.893	2.3	.55	211.26
12:00 noon	<u>66</u>	<u>16.28</u>	<u>789.32</u>	12	14	11.959	16.5	4.07	197.33
2:57 p.m.	<u>216</u>	<u>52.63</u>	<u>469.88</u>	7	5	2.175	54.0	13.16	117.47
3:04 p.m.	<u>364</u>	<u>86.94</u>	<u>785.60</u>	5	4	2.158	91.0	21.74	196.40
3:34 p.m.	<u>228</u>	<u>55.92</u>	<u>527.44</u>	6	6	2.313	57.0	13.98	131.86
4:33 p.m.	<u>970</u>	<u>236.36</u>	<u>575.72</u>	2	1	.594	242.5	59.09	143.93
5:06 p.m.	<u>72</u>	<u>17.62</u>	<u>622.16</u>	11	11	8.641	18.0	4.41	155.54
5:40 p.m.	<u>22</u>	<u>5.38</u>	<u>568.32</u>	20	21	25.833	5.5	1.35	142.08
11:05 p.m.	<u>14</u>	<u>3.43</u>	<u>553.44</u>	23	25	39.531	3.5	.86	138.36
12:11 a.m.	<u>8</u>	<u>1.92</u>	<u>549.72</u>	28	28	68.715	2.0	.48	137.43
1:05 a.m.	<u>24</u>	<u>6.11</u>	<u>553.44</u>	19	20	23.060	6.0	1.53	138.36
at- 7:00 a.m.	<u>11</u>	<u>3.15</u>	<u>177.56</u>	25	18	16.142	2.8	.79	44.39
8:07 a.m.	<u>2</u>	<u>.30</u>	<u>177.56</u>	30	29	88.780	.5	.08	44.39
TOTAL	4,607	1,122.64	18,160.84			3.942	1,151.8	280.66	4,540.21

* - Discontinued buses underlined

The basic planning data used by the MTDP staff came from several administratively independent secondary sources. A major problem with these data was that the cooperating agencies do not use identical definitions for their basic sampling units. For example, the U. S. Bureau of the Census records their population statistics by "census tracts" and "census blocks" whereas the Missouri Highway Department uses the concepts of "transportation zones" and "transportation blocks." A method, therefore, had to be found to convert the data from different agencies to the same geographic base.

The East-West Gateway Coordinating Council is highly dependent on demographic and economic statistics by fine geographic breakdown for effective planning and evaluation of the programs under its sponsorship. This agency, as a result, produced a general computer method for correlating and converting data from one geographic unit to another. For example, data received by U. S. Census Bureau "census block" can be reproduced by Missouri Highway Department "transportation zone" with the assistance of the East West Gateway Coordinating Council "Geographic Master Index File." The MTDP staff used this index as a basis for

developing a computer program for the conversion and integration of all our input data into the Missouri Highway Department's "transportation zones" or "transportation blocks." The output of this computer program is referred to as the Mass Transportation Master File (MTMF). Figure VI-1 shows the steps followed in producing the population statistics contained in the MTMF. A similar series of data processing steps will be followed in generating the employment statistics contained in the MTMF.

The data processing sequence presented in the block diagram of Figure VI-1 can be described by relating it to the input data. The program starts with two secondary data sources: 1) 1960 Census population data by census tract and block provided by the U. S. Bureau of the Census; and 2) the East West Gateway Coordinating Council Geographic Master Index File. The first page of Figure VI-1 shows how the information from these two sources is integrated making 1960 Census population data available by "transportation block" as well as by census block and census tract.

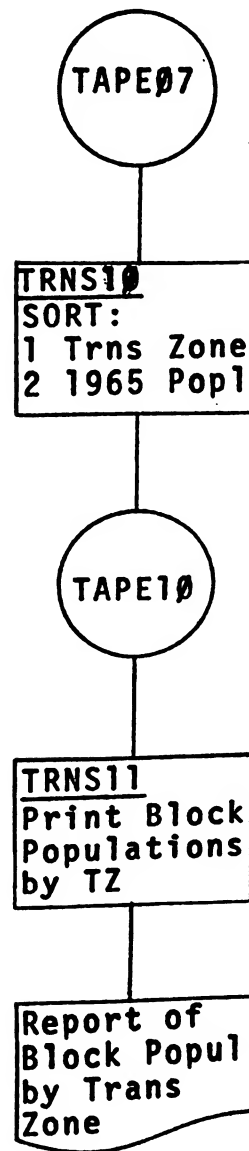
The ultimate objective of this portion of the MTMF is to make population data available in estimate form, for the year 1965 by a variety of geographic configurations.

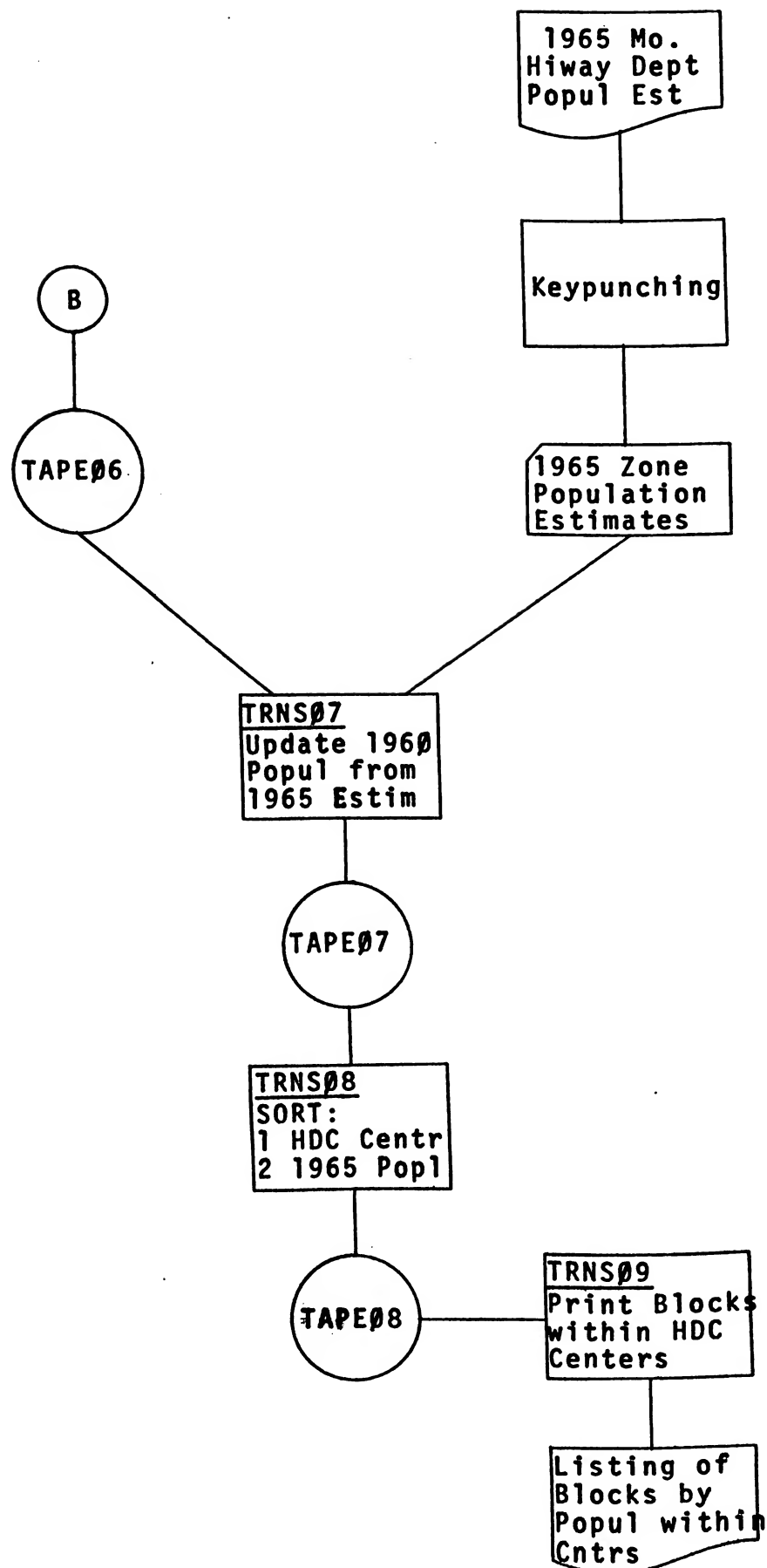
The next step in the procedure was, then, to delete all 1960 population statistics for blocks demolished (85 percent or more by acreage) and not rebuilt during the period 1960-1965. The remaining blocks in each transportation zone were then used as a basis for distributing the 1965 Missouri Highway Department population estimates by "transportation zone" over the "transportation blocks" in each zone in proportion to their 1960 share of zone population (see third page of Figure VI-1.) In this manner, the 1960 Census data were used as a basis for arriving at "transportation block" estimates of the population of the City of St. Louis.

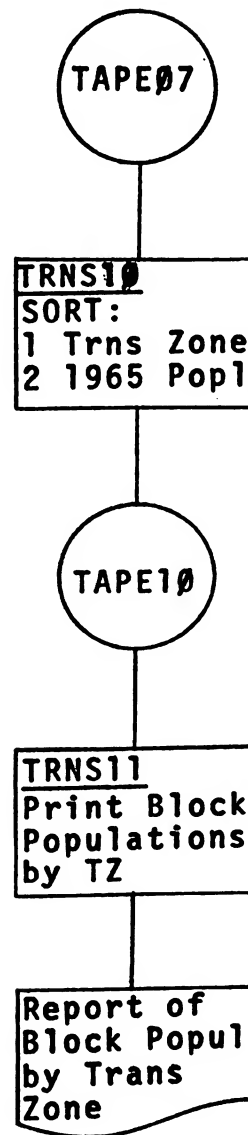
The population statistics in the MTMF can be used for analysis by a wide variety of geographic subdivisions; for example, by HDC Gateway Center, or by Model City Target area. A major use of the population statistics is for the analysis of origin zone "population corridors". A computer program has been written which produces aggregate population statistics for any combination of city blocks desired. This makes it possible for the MTDP staff to get quick estimates of the potential population served by any line alternative. The speed of processing this information is enhanced by the fact that modular changes in all line

alternatives can be made by the addition and subtraction of appropriate geographic segments.

The employment data contained in the completed Mass Transportation Master File will provide the same flexibility in analyzing the potential employment opportunities available in alternative transportation destination "employment corridors."







APPENDIX I

Staff and Organizational Structure

STAFF AND ORGANIZATIONAL STRUCTURE

The Mass Transportation Demonstration Project is organizationally a part of the Division of Planning, Analysis, and Support Services at the Human Development Corporation. The Project Coordinator reports directly to Mr. Robert J. Baer, Chief of Planning, Analysis, and Support Services. He, in turn, reports directly to Mr. Clyde S. Cahill, Jr., The Corporation's General Manager.

The MTDP has had the assistance of many persons during the planning phase of the project. It is particularly pleasing to note that those who have worked with us and gone on to other endeavors have used their experience with the project constructively. Arthur Stickgold, a Sub-city Planner, is now an Assistant Professor of Urban Affairs at St. Louis University. Barry Phegan, also a Sub-city Planner, is presently directing the Neighborhood Renewal Program in East St. Louis, Illinois. These gentlemen have been replaced by Anthony Hayes and Hugh White. Mrs. Marjorie Ramsey, the Project's Secretary, has taken a position as an Administrative Service Aide with HDC's Department of Youth and Special Programs. She has been replaced by Mrs. Pearline Deanes. Our three Program Assistants have taken positions with the Department of Research, Planning, and Program Development: Luther Mitchell and Henry Thomas are Research Assistants and William Porter is a Program Development Specialist. Jerry Margulis, Senior Systems Analyst, has taken a similar position with our Data Center.

The Project has been fortunate in having been able to obtain the assistance of well qualified personnel on a temporary basis in connection with the performance of special short term projects. These have included Mr. Robert Rose, Miss Alfreda Verratti, and Mr. Edward Kilpatrick, all of whom have returned to graduate school. The present permanent staff of the MTDP is listed below.

Joseph S. Hupert, Coordinator

Pearline Deanes, Secretary

Anthony Hayes, Sub-city Planner

Ann McHale, Clerical Assistant III

Myron Pollack, Senior Research Analyst

Hugh White, Sub-city Planner

HUMAN development



